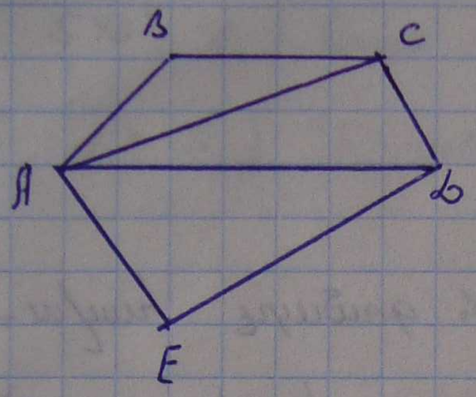
05.09.2005թ.

Խնդիր 1



Պրիզմայի է ABCDE հոծույթի հիմքերը, որի A գագաթից դուրս են տարված AC, AD անկյունագծերը, որոնցով բաժանված է երեք՝ ABC, ACD և ADE եռանկյունների:

Պրիզմայի է MNKLFH հոծույթի հիմքերը, որի M գագաթից դուրս են տարված MK, ML, MF անկյունագծերը, որոնցով այդ բազմանկյունը բաժանվում է 4՝ MNK, MKL, MLF, MFH եռանկյունների:

Խնդիր 2

Ուռուցիկ բազմանկյունների անկյունների գումարը որոշվում է $(n-2)\cdot 180^\circ$ բանաձևով, որտեղ n-ը բազմանկյան անկյունների թիվն է:

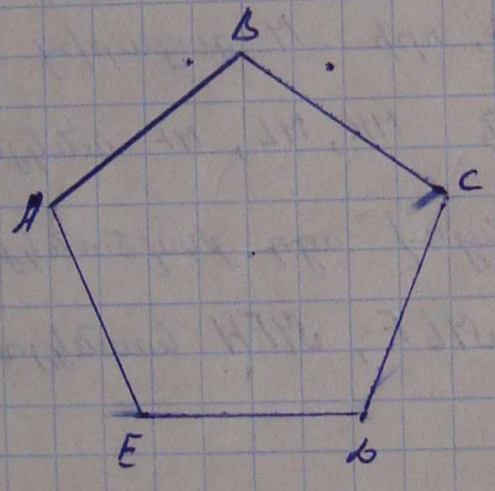
Ուռուցիկ եզրագիծ անկյունների գումարը հավա-

шար է՝ $(5-2)\cdot 180^\circ = 540^\circ$, իսկ վեցանկյունը՝ $(6-2)\cdot 180^\circ = 720^\circ$; իսկ տասանկյունը՝ $(10-2)\cdot 180^\circ = 1440^\circ$:

Խնդիր 3

Ցանկացած ուռուցիկ բազմանկյան գումարը հավասար է 360°: Քանի որ ուռուցիկ քառանկյունը հավասար է, ապա քառանկյան յուրաքանչյուր անկյունը 90°-ի է, այսինքն ցանկացած քառանկյան անկյունները ճիշտ են:

Խնդիր 4



Պրիզմայի է ABCDE հավասար անկյունների քանակով, որտեղ $\angle A + \angle B + \angle C + \angle D + \angle E = 540^\circ \Rightarrow$

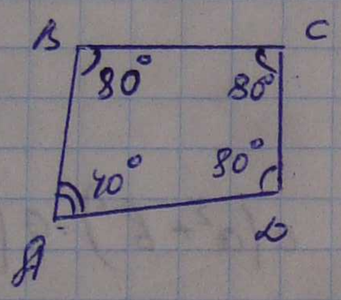
$\Rightarrow \angle A = \angle B = \angle C = \angle D = \angle E = \frac{540^\circ}{5} =$

$= 108^\circ$:

Խնդիր 5

Երեք ուռուցիկ բազմանկյունների անկյունների գումարը 540° է, ապա այդ տեսակ ($n-2 = \frac{540}{180} = 3$ կամ $n = 5$) 5 անկյուն, և հետևաբար նաև 5 կող:

Խնդիր 6



Պրիզմայի հիմքը ABCD ուռուցիկ քառանկյուն է, որում $\angle B = \angle C = \angle D$ և $\angle A = \angle B - 40^\circ$

$\angle A + \angle B + \angle C + \angle D = 360^\circ \Rightarrow 4\angle B - 40^\circ = 360^\circ$

$4\angle B = 320^\circ$

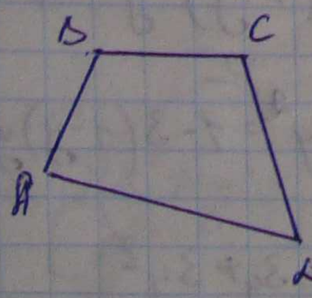
$\angle B = 80^\circ$

Ուրեմն, որ $\angle B = \angle C = \angle D = 80^\circ$, և $\angle A = \angle B - 40^\circ = 40^\circ$:

Պատ՝ $\angle B = \angle C = \angle D = 80^\circ$

$\angle A = 40^\circ$:

Խնդիր 7



(BC = AB + 10)

$\angle D$; $\angle C = \angle D + 10^\circ$, $\angle B = \angle C + 20^\circ = \angle D + 30^\circ$

$\angle A = \angle B + 30^\circ$, $= \angle D + 60^\circ$

$\angle A + \angle B + \angle C + \angle D = 540^\circ$

$\angle D + 60^\circ + \angle D + 30^\circ + \angle D + 10^\circ + \angle D = 540^\circ$

$3\angle D = 540^\circ - 100^\circ$

$3\angle D = 340^\circ$

$\angle D = 113^\circ 30'$.

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Умн. 9.

Умовимося, що $ab^{-1} = bc^{-1}$, тоді $c(a^2+b^2) = a(b^2+c^2)$

$ab^{-1} = bc^{-1}$:

$a \cdot \frac{1}{b} = b \cdot \frac{1}{c}$

$\frac{a}{b} = \frac{b}{c} \Rightarrow ac = b^2$

$c(a^2+b^2) = a(b^2+c^2)$

$ca^2 + ac^2 = a^2c + c^2a$

$ca^2 + ac^2 = ca^2 + ac^2$

3) Умовимося, що якщо $x+y=1$, тоді $x^3+y^3 = 1-3xy$

$x+y=1$

$x = 1-y$

$(1-y)^3 + y^3 = 1 - 3\cdot(1-y)\cdot y$

$1 - y^3 - 3\cdot 1^2 \cdot y + 3\cdot 1\cdot y^2 + y^3 = 1 - 3(1-y)y$

$1 - y^3 - 3y + 3y^2 + y^3 = 1 - 3y + 3y^2$

$1 - 3y + 3y^2 = 1 - 3y + 3y^2$

5) Дано $x + y + z = 0$, нужно $x^3 + y^3 + z^3 = 3xyz$

$x = -(y + z)$ $\quad x^3 + y^3 + z^3 = 3xyz$

$-(y+z)^3 + y^3 + z^3 = -3(y+z)yz$

$-(y^3 + z^3 + 3y^2z + 3yz^2) + y^3 + z^3 = -3(y+z)yz$

$-y^3 - z^3 - 3y^2z - 3yz^2 + y^3 + z^3 = -3y^2z - 3z^2y$

$3y^2z + 3yz^2 = 3y^2z + 3z^2y$

7) Дано $x + y = \sqrt{18}$, $x - y = \sqrt{14}$, найти $(x^2 + y^2)$ - ?

Решение 5:

$(x+y)^2 = (\sqrt{18})^2$ $\quad (x-y)^2 = (\sqrt{14})^2$

$x^2 + 2xy + y^2 = 18$ $\quad x^2 - 2xy + y^2 = 14$

$\begin{cases} x^2 + 2xy + y^2 = 18 \\ x^2 - 2xy + y^2 = 14 \end{cases} \Rightarrow \begin{cases} 2x^2 + 2y^2 = 14 + 18 \Rightarrow \end{cases}$

$\Rightarrow \begin{cases} 2(x^2 + y^2) = 32 \\ x^2 + y^2 = 16 \end{cases}$

9) $x - y = \sqrt[3]{18}$; $xy = \sqrt[3]{12}$, найти $(x^3 - y^3)$ - с помощью

т/ч 5:

$(x-y)^3 = (\sqrt[3]{18})^3$

$x^3 - y^3 - 3x^2y + 3xy^2 = 18$

$x^3 - y^3 - 3(x^2y - xy^2) = 18$

$x^3 - y^3 - 3 \cdot 6 = 18$

$x^3 - y^3 = 18 + 18 = 36$

~~$(xy)^3 = (\sqrt[3]{12})^3$~~

$\sqrt[3]{18} \cdot xy = \sqrt[3]{12} \cdot \sqrt[3]{18}$

$\sqrt[3]{18}\, xy = 6$

$(x-y)(xy) = 6$

$x^2y - xy^2 = 6$

Решить иррациональное уравнение

(11) если $a + a^{-1} = 7$),

11) $a^2 + a^{-2}$, если $a + a^{-1} = 7$

$a^2 + \frac{1}{a^2} = \frac{a^4+1}{a^2}$

$a + \frac{1}{a} = 7$

$\frac{a^4+1}{a^2} = 47$

$\frac{a^2+1}{a} = 7$

$\left(\frac{a^2+1}{a}\right)^2 = 49$

$\frac{a^4+2a^2+1}{a^2} = 49$

$\frac{a^4+1}{a^2} + \frac{2a^2}{a^2} = 49$

$$\frac{a^4+1}{a^2} = 47$$

13) $a^2 + 4a^{-2}$, если $a + 2a^{-1} = 6$

$$a^2 + \frac{4}{a^2} = \frac{a^4+4}{a^2} \Rightarrow$$

$$\Rightarrow \frac{a^4+4}{a^2} = 32$$

$$a + 2a^{-1} = 6$$

$$a + \frac{2}{a} = 6$$

$$\frac{a^2+2}{a} = 6$$

$$\left(\frac{a^2+2}{a}\right)^2 = 36$$

$$\frac{a^4+4a^2+4}{a^2} = 36$$

$$\frac{a^4+4}{a^2} + \frac{4a^2}{a^2} = 36$$

$$\frac{a^4+4}{a^2} = 32$$

15) $a^3 + a^{-3}$, если $a + a^{-1} = 4$

$$a^3 + \frac{1}{a^3} = \frac{a^6+1}{a^3}$$

$$\frac{a^6+1}{a^3} = 52$$

$$a + \frac{1}{a} = 4$$

$$\frac{a^2+1}{a} = 4$$

$$\left(\frac{a^2+1}{a}\right)^3 = 64$$

$$\frac{a^6+1+3a^4+3a^2}{a^3} = 64$$

$$\frac{a^6+1}{a^3} + \frac{3a^2(a^2+1)}{a^3} = 64$$

$$\frac{a^6+1}{a^3} + 3\frac{a^2+1}{a} = 64$$

$$\frac{a^6+1}{a^3} = 52$$

17) $a^3 - a^{-3}$, tpt $a - a^{-1} = 4$

$$a^3 - \frac{1}{a^3} = \frac{a^6-1}{a^3}$$

$$\frac{a^6-1}{a^3} = 76$$

$$a - a^{-1} = 4$$

$$a - \frac{1}{a} = 4$$

$$\frac{a^2-1}{a} = 4$$

$$\left(\frac{a^2-1}{a}\right)^3 = 64$$

$$\frac{a^6 - 1 - 3a^4 + 3a^2}{a^3} = 64$$

$$\frac{a^6-1}{a^3} - \frac{3a^2(a^2-1)}{a^3} = 64$$

$$\frac{a^6-1}{a^3} - 3\frac{a^2-1}{a} = 64$$

$$\frac{a^6-1}{a^3} = 76$$

191) $2^x + 2^{1-x}$, tpt $4^x + 4^{1-x} = 5$

$4^x + 4^{1-x} = (2^x)^2 + (2^{1-x})^2 = (2^x + 2^{1-x})^2 - 2 \cdot 2^x \cdot 2^{1-x} =$

$= (2^x + 2^{1-x})^2 - 2^{1+x+1-x} = (2^x + 2^{1-x})^2 - 4 =$

$= 5$

$(2^x + 2^{1-x})^2 = 9$

$\sqrt{(2^x + 2^{1-x})^2} = \sqrt{9}$

$2^x + 2^{1-x} = 3$

21) $3^x + 3^{2-x}$, եթե $9^x + 9^{2-x} = 18$

$$9^x + 9^{2-x} = (3^x)^2 + (3^{2-x})^2 = (3^x + 3^{2-x})^2 - 2\cdot 3^x \cdot 3^{2-x} =$$

$$= (3^x + 3^{2-x})^2 - 2\cdot 3^2 = (3^x + 3^{2-x})^2 - 18 = 18$$

$$(3^x + 3^{2-x})^2 = 36$$

$$3^x + 3^{2-x} = 6$$

23) $3^x + 4\cdot 3^{-x}$, եթե $9^x + 16\cdot 9^{-x} = 41$

$$9^x + 16\cdot 9^{-x} = (3^x)^2 + \left(4\cdot\frac{3}{3^x}\right)^2 = \left(3^x + \frac{4}{3^x}\right)^2 - 2\cdot 3^x\cdot\frac{4}{3^x} =$$

$$= (3^x + 4\cdot 3^{-x})^2 - 8 = 41$$

$$(3^x + 4\cdot 3^{-x})^2 = 49$$

$$3^x + 4\cdot 3^{-x} = 7$$

25) $\dfrac{x^3a^2 + y^3a^2}{a(x^2+y^2) - axy} = \dfrac{a^2(x^3+y^3)}{a(x^2+y^2-xy)} = \dfrac{a(x+y)(x^2-xy+y^2)}{(x^2+y^2-xy)}$

$$= a(x+y)$$

27) $\frac{20+x-x^2}{x-30+x^2} = \frac{-(x^2-x-20)}{x^2+x-30} = \frac{-(x-4)(x+5)}{(x+5)(x-6)} =$

$= -\frac{x-4}{x-6}$

28) $\frac{-12y^2+y+16}{5y+2+3y^2} = \frac{-(12y^2+y-6)}{3y^2+5y+2} = \frac{-(3y+2)(4y-3)}{(3y+2)(y+1)} =$

$= -\frac{4y-3}{y+1}$

31) $\frac{c^2-c-110}{22+9c-c^2} = \frac{c^2-c-110}{-(c^2-9c-22)} = \frac{(c-11)(c+10)}{-(c-11)(c+2)} =$

$= -\frac{c+10}{c+2}$

33) $\frac{a\sqrt{a}-b\sqrt{b}}{\sqrt{a}-\sqrt{b}} = \frac{(\sqrt{a})^3-(\sqrt{b})^3}{\sqrt{a}-\sqrt{b}} =$

$= \frac{(\sqrt{a}-\sqrt{b})((\sqrt{a})^2+\sqrt{a}\cdot\sqrt{b}+(\sqrt{b})^2}{\sqrt{a}-\sqrt{b}} =$

$= a + \sqrt{a}\cdot\sqrt{b} + b = a + b + \sqrt{ab}$

35) $\dfrac{2\sqrt{2} - x\sqrt{x}}{2 + \sqrt{2x} + x} = \dfrac{(\sqrt{2})^3 - (\sqrt{x})^3}{2 + \sqrt{2x} + x} =$

$= \dfrac{(\sqrt{2} - \sqrt{x})\left((\sqrt{2})^2 + \sqrt{2}\cdot\sqrt{x} + (\sqrt{x})^2\right)}{2 + \sqrt{2x} + x} =$

$= \dfrac{(\sqrt{2} - \sqrt{x})(2 + \sqrt{2x} + x)}{2 + \sqrt{2x} + x} = 2\sqrt{2} - \sqrt{x}$

37) $\dfrac{b^4 + b^2 + 1}{b^2 + b + 1} = \dfrac{(b^2 - 1)(b^4 + b^2 + 1)}{(b-1)(b^2 + b + 1)} =$

$= \dfrac{\dfrac{b^6 - 1}{b^2 - 1}}{\dfrac{b^3 - 1}{b - 1}} = \dfrac{b^6 - 1}{b^2 - 1} \cdot \dfrac{b - 1}{b^3 - 1} = \dfrac{b^6 - 1}{(b^3 - 1)(b + 1)} =$

$= \dfrac{(b^3)^2 - 1}{(b^3 - 1)(b + 1)} = \dfrac{(b^3 - 1)(b^3 + 1)}{(b^3 - 1)(b + 1)} = \dfrac{(b+1)(b^2 - b + 1)}{b + 1} =$

$= b^2 - b + 1$

39) $\frac{x^4 - x^2 - 12}{4x - x^3} = \frac{x^4 - x^2 - 12}{-x(x^2 - 4)} = \frac{(x^2 - 4)(x^2 + 3)}{-x(x^2 - 4)} =$

$= -\frac{x^2 + 3}{x}$

22. Тест 1 г

1) $2^{13} \cdot (36^2 \cdot 162^5 \cdot 48^4)^5 \cdot (108 \cdot 72)^{28} : (25 \cdot 128)^4 \cdot 5^7 :$

$: (125 \cdot 160^2)^3 = 2^{13} \cdot (2^4 \cdot 3^4 \cdot 2^5 \cdot 3^{20} \cdot 2^{16} \cdot 3^4)^5 : 5^7 :$

$: (5^3 \cdot 2^{10} \cdot 5^2)^3 = 2^{13} (2^{25} \cdot 3^{38})^5 \cdot (2^5 \cdot 3^5)^{-28} -$

$- (5^2 \cdot 2^7)^4 \cdot 5^7 : (5^5 \cdot 2^{10})^3 = 2^{13} \cdot 2^{125} \cdot 3^{140} \cdot 2^{-140} \cdot$

$\cdot 3^{-140} - 5^8 \cdot 2^{28} \cdot 5^7 : 5^{15} \cdot 2^{30} = 2^{-2} - 5^8 : 2^{28} \cdot$

$\cdot 5^{-8} \cdot 2^{-30} = 2^{-2} - 2^{-2} = 0.$

2) $\left(27^{\frac{2}{3}} + 0{,}0625\right)^{-0{,}75} - 25^{0{,}5}\left)\left(81^{0{,}75} + \left(\frac{1}{125}\right)^{\frac{1}{3}} -\right.\right.$

$- \left(\frac{1}{32}\right)^{\frac{-4}{5}}\Big) = \left(3^3\right)^{\frac{2}{3}} + \left(\left(\frac{1}{2}\right)^4\right)^{-\frac{3}{4}} - \left(5^2\right)^{\frac{1}{2}} -$

$- \left(\left(3^4\right)^{\frac{3}{4}}\right) + \left(\left(\frac{1}{5}\right)^3\right)^{-\frac{1}{3}} - \left(\left(\frac{1}{2}\right)^5\right)^{-\frac{4}{5}} =$

$$\left(3^2+\left(\frac{1}{2}\right)^{-3}-5\right)\left(3^3+\left(\frac{1}{5}\right)^{-1}-\left(\frac{1}{2}\right)^{-4}\right)=$$

$$=(9+8-5)(27+5-16)=12\cdot 16=196$$

3) $\left(100^{-0,5}\cdot 64^{\frac{4}{3}}\cdot 0,2^{-\frac{1}{2}}\cdot 4^{-\frac{3}{4}}\cdot 4^{-0,75}\right)^4 :$

$$:\sqrt{10}\cdot\left(\sqrt{10^{-6}}\right)^{-\frac{1}{2}}=\left(\left(2^4\cdot 5\right)^2\right)^{-\frac{1}{2}}\cdot$$

$$\cdot\left(2^6\right)^{\frac{4}{3}}\cdot\left(\frac{1}{5}\right)^{-\frac{1}{2}}\cdot\left(2^2\right)^{-\frac{3}{4}}\cdot\left(2^2\right)^{-\frac{3}{4}}\Big):\left(2\cdot 5\right)^{\frac{1}{2}}\cdot$$

$$\cdot\left(\left(2\cdot 5\right)^{-\frac{6}{2}}\right)^{-\frac{1}{2}}=\Big(\left(2\cdot 5\right)^{-1}\cdot 2^8\cdot 5^{\frac{1}{2}}\cdot\left(2^4\right)^{-\frac{3}{4}}\Big):$$

$$:\left(2\cdot 5\right)^{\frac{1}{2}}\cdot\left(2\cdot 5\right)^{\frac{3}{2}}=\left(2^{-1}\cdot 5^{-1}\cdot 2^8\cdot 5^{\frac{1}{2}}\cdot 2^{-3}\right):$$

$$:2^{\frac{1}{2}}\cdot 5^{\frac{1}{2}}\cdot 2^{\frac{3}{2}}\cdot 5^{\frac{3}{2}}=$$

$$=\left(2^4\cdot 5^{-\frac{1}{2}}\right):\left(2^{\frac{1}{2}}\cdot 5^{\frac{1}{2}}\right)\cdot 2^{\frac{3}{2}}\cdot 5^{\frac{3}{2}}=$$

$$=2^5\cdot 5^{\frac{1}{2}}=32\cdot\sqrt{5}$$

7)

=

=

=

=

1) $\frac{\sqrt{x+1}+}{2+\sqrt{x+}}$

$\left(\sqrt{x+1}-1\right)$

7) $\frac{1}{\sqrt{2}+\sqrt{3}+1} \cdot \frac{\sqrt{2}-\sqrt{3}-1}{\sqrt{2}-\sqrt{3}-1} =$

$= \frac{\sqrt{2}-\sqrt{3}-1}{(2-\sqrt{6}-\sqrt{2}+\sqrt{6}-3-\sqrt{3}+\sqrt{2}-\sqrt{3}-1)} =$

$= \frac{\sqrt{2}-\sqrt{3}-1}{2-3-\sqrt{3}-1} = \frac{\sqrt{2}-\sqrt{3}-1}{-2(1+\sqrt{3})} =$

$= \frac{(\sqrt{2}-\sqrt{3}-1)(1-\sqrt{3})}{-2(1+\sqrt{3})(1-\sqrt{3})} = \frac{(\sqrt{2}-\sqrt{3}-1)(1-\sqrt{3})}{-2(1-\sqrt{3}+\sqrt{3}-3)} =$

$= \frac{(\sqrt{2}-\sqrt{3}+1)(1-\sqrt{3})}{4}$

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1) $\frac{\sqrt{x+1}+1}{2+\sqrt{x+1}+x} \cdot \left(\sqrt{(x+1)^3}-1\right) = \frac{\sqrt{x+1}+1}{2+\sqrt{x+1}+x}$

$(\sqrt{x+1}-1)(\sqrt{(x+1)^2}+\sqrt{x+1}+1) = \frac{(\sqrt{x+1}+1)(\sqrt{x+1}-1)(x+\sqrt{x+1}+2)}{2+\sqrt{x+1}+x} =$

$= \left(\sqrt{x+1}+1\right)\left(\sqrt{x+1}-1\right) = x+1-1 = x = 12$

3)

2) $\dfrac{(5-\sqrt{x})^3}{5+\sqrt{x}} : \left(\dfrac{5}{5+\sqrt{x}} - \dfrac{\sqrt{x}}{\sqrt{x}-5} - \dfrac{10\sqrt{x}}{25-x}\right) + 10\sqrt{x} =$

$= \dfrac{(5-\sqrt{x})^3}{5+\sqrt{x}} : \left(\dfrac{5}{5+\sqrt{x}} + \dfrac{\sqrt{x}}{5-\sqrt{x}} - \dfrac{10\sqrt{x}}{25-x}\right) + 10\sqrt{x} =$

$= \dfrac{(5-\sqrt{x})^3}{5+\sqrt{x}} \cdot \dfrac{(5-\sqrt{x})(5+\sqrt{x})}{5(5-\sqrt{x})+\sqrt{x}(5+\sqrt{x})-10\sqrt{x}} + 10\sqrt{x} =$

$= \dfrac{(5-\sqrt{x})^3(5-\sqrt{x})}{25-5\sqrt{x}+5\sqrt{x}+x-10\sqrt{x}} = \dfrac{(5-\sqrt{x})^3(5-\sqrt{x})}{(5-\sqrt{x})^2} + 10\sqrt{x} =$

$= 10\sqrt{x} + (5-\sqrt{x})^2 = 25-10\sqrt{x}+x+10\sqrt{x} = 25+x = 36$

3) $\left(\sqrt[3]{x}+1\right)\left(\sqrt[3]{x} - \dfrac{1}{1-\sqrt[3]{x}}\right) :$

3) $\left(\sqrt[3]{x}+1\right)\left(\sqrt[3]{x}-\frac{1}{1-\sqrt[3]{x}}\right)\cdot\frac{\sqrt[3]{x^2}-2\sqrt[3]{x}+1}{\sqrt[3]{x^2}-\sqrt[3]{x}+1}=$

$\sqrt{x}=$

$=\left(\sqrt[3]{x}+1\right)\left(\frac{-\left(\sqrt[3]{x^2}-\sqrt[3]{x}+1\right)}{1-\sqrt[3]{x}}\right)\cdot\frac{\left(\sqrt[3]{x}-1\right)^2}{\sqrt[3]{x^2}-\sqrt[3]{x}+1}=$

$0\sqrt{x}=$

$=\left(\sqrt[3]{x}+1\right)\left(\frac{1}{\sqrt[3]{x}-1}\right)\cdot\frac{\left(\sqrt[3]{x}-1\right)^2}{}=$

$\sqrt{x}=$

$=\left(\sqrt[3]{x}+1\right)\left(\sqrt[3]{x}-1\right)=\left(\sqrt[3]{x}\right)^2-1=$

$=\sqrt[3]{\left(3\sqrt{3}\right)^2}-1=2$

$0\sqrt{x}=$

4) $\left(\frac{\sqrt[4]{4x^3}-2\sqrt[4]{4x}}{2-\sqrt{x}}+\frac{18+2\sqrt{x}}{\sqrt[4]{4x}}\right):\frac{x+1}{\sqrt[4]{4x}}=$

6

$=\left(\frac{\sqrt[4]{4x}\left(\sqrt[4]{4x^3}-2\sqrt[4]{4x}\right)+\left(18+2\sqrt{x}\right)\left(2-\sqrt{x}\right)}{\left(2-\sqrt{x}\right)\left(\sqrt[4]{4x}\right)}\right)\cdot\frac{\sqrt[4]{4x}}{x+1}=$

$=\frac{2x-4\sqrt{x}+36-18\sqrt{x}+4\sqrt{x}-2x}{\left(2-\sqrt{x}\right)\left(x+1\right)}=$

$$= \frac{18(2-\sqrt{x})}{(2-\sqrt{x})(x+1)} = \frac{18}{5+1} = 3$$

5) $$\sqrt{x}\left(2\sqrt{x}+1-\frac{1}{1-2\sqrt{x}}\right) : \left(2\sqrt{x}-\frac{4x}{2\sqrt{x}-1}\right) =$$

$$= \sqrt{x}\left(\frac{(1+2\sqrt{x})(1-2\sqrt{x})-1}{1-2\sqrt{x}}\right) : \left(\frac{2\sqrt{x}(2\sqrt{x}-1)-4x}{2\sqrt{x}-1}\right) =$$

$$= \sqrt{x}\,\frac{1+4x-1}{1-2\sqrt{x}} \cdot \frac{2\sqrt{x}-1}{4x-2\sqrt{x}-4x} =$$

$$= \frac{\sqrt{x}\cdot 4x}{-2\sqrt{x}} = -2x = -14$$

6) $$\left(x+2\sqrt{x}+1\right)^{-1}\left(\frac{1}{\sqrt[4]{x}+1}+\frac{\sqrt{x}+3}{\sqrt{x}-1}-\frac{1}{\sqrt[4]{x}-1}\right) =$$

$$= \frac{1}{(\sqrt{x}+1)^2} \cdot \frac{\sqrt[4]{x}-1+\sqrt{x}+3-\sqrt[4]{x}-1}{\sqrt{x}-1} =$$

$$= \frac{\sqrt{x}+1}{(\sqrt{x}+1)^2(\sqrt{x}-1)} = \frac{1}{x-1} = \frac{1}{2-1} = 1$$

7) $\left(\frac{\sqrt{x}-2}{x+2\sqrt{x}} - \frac{1}{x-4} : \frac{\sqrt{x}+2}{(2-\sqrt{x})^2}\right) \cdot \frac{(\sqrt{x}+2)^3}{\sqrt{x}} =$

$= \left(\frac{\sqrt{x}-2}{x+2\sqrt{x}} - \frac{1}{(\sqrt{x})^2-2^2} \cdot \frac{(2-\sqrt{x})^2}{\sqrt{x}+2}\right) \cdot \frac{(\sqrt{x}+2)^3}{\sqrt{x}} =$

$= \left(\frac{\sqrt{x}-2}{\sqrt{x}(\sqrt{x}+2)} + \frac{(\sqrt{x}-2)^2}{(\sqrt{x}-2)(\sqrt{x}+2)^2}\right) \cdot \frac{(\sqrt{x}+2)^3}{\sqrt{x}} =$

$= \frac{(\sqrt{x}-2)(\sqrt{x}+2) - \sqrt{x}(\sqrt{x}+2)}{\sqrt{x}(\sqrt{x}+2)^2} \cdot \frac{(\sqrt{x}+2)^3}{\sqrt{x}} =$

$= \frac{(\sqrt{x}-2)(\sqrt{x}+2-\sqrt{x})}{x} \cdot (\sqrt{x}+2) = \frac{2(x-4)}{x} =$

$= \frac{14-8}{7} = \frac{6}{7}$

8) $(\sqrt[4]{x} - \sqrt[4]{2})(\sqrt{x^3} + 2\sqrt{2}) : \frac{x - \sqrt{2x} + 2}{\sqrt[4]{x} + \sqrt[4]{2}} =$

$= (\sqrt[4]{x} - \sqrt[4]{2})((\sqrt[3]{x} + \sqrt{2})(x - \sqrt{2x} + 2) \cdot$

$\cdot \frac{\sqrt[4]{x} + \sqrt[4]{2}}{x - \sqrt{2x} + 2} = \sqrt[4]{x}(\sqrt{x} - \sqrt{2})(\sqrt{x} + \sqrt{2}) =$

$= x - 2 = 19$

9) $\left(\frac{x+1}{\sqrt[3]{x}+1} + \sqrt[3]{x}\right) : \frac{\sqrt[3]{x^2}+1}{x^2-1} =$

$= \frac{x+1+\sqrt[3]{x}(\sqrt[3]{x}+1)}{\sqrt[3]{x}+1} \cdot \frac{(x^2-1)(x+1)}{\sqrt[3]{x^2}+1} =$

$= \frac{(\sqrt[3]{x}+1)(\sqrt[3]{x^2} - \sqrt[3]{x}+1) + \sqrt[3]{x}(\sqrt[3]{x}+1)}{\sqrt[3]{x}+1} \cdot \frac{(x-1)(x+1)}{\sqrt[3]{x^2}+1} =$

10)

$$= \frac{(\sqrt[3]{x}+1)(\sqrt[3]{x^2}+1)}{\sqrt[3]{x}+1} \cdot \frac{x^2-1}{\sqrt[3]{x^2}+1} = 35$$

10) $\left(\frac{x-1}{\sqrt[3]{x}-1} + \sqrt[3]{x}\right)\left(\frac{x+1}{\sqrt[3]{x}+1} - \sqrt[3]{x}\right) =$

$$= \frac{(\sqrt[3]{x}-1^3)}{\cdot} \cdot \left(\frac{x-1+\sqrt[3]{x}(\sqrt[3]{x}-1)}{\sqrt[3]{x}-1}\right) \cdot \left(\frac{x+1-\sqrt[3]{x}(\sqrt[3]{x}+1)}{\sqrt[3]{x}+1}\right) =$$

$$= \frac{(\sqrt[3]{x}-1)(\sqrt[3]{x^2}+\sqrt[3]{x}+1)+\sqrt[3]{x}(\sqrt[3]{x}-1)}{\sqrt[3]{x}-1} \cdot$$

$$\cdot \frac{(\sqrt[3]{x}+1)(\sqrt[3]{x^2}-\sqrt[3]{x}+1)-\sqrt[3]{x}(\sqrt[3]{x}+1)}{\sqrt[3]{x}+1} =$$

$$= \frac{(\sqrt[3]{x}-1)(\sqrt[3]{x^2}+2\sqrt[3]{x}+1)}{\sqrt[3]{x}-1} \cdot \frac{(\sqrt[3]{x}+1)(\sqrt[3]{x^2}-2\sqrt[3]{x}+1)}{\sqrt[3]{x}+1} =$$

$$= (\sqrt[3]{x^2}+2\sqrt[3]{x}+1)(\sqrt[3]{x^2}-2\sqrt[3]{x}+1) =$$

$$= (\sqrt[3]{x}+1)^2 \cdot (\sqrt[3]{x}-1)^2 = (\sqrt[3]{x^2}-1)^2 =$$

$$\left(\left(\sqrt[3]{2\sqrt{2}}\right)^2 - 1\right)^2 = (2-1)^2 = 1$$

11) $$\left(\frac{\sqrt{x}+\sqrt{3}}{\sqrt{x}-\sqrt{3}} - \frac{\sqrt{x}-\sqrt{3}}{\sqrt{x}+\sqrt{3}}\right)\left(\frac{x\sqrt{3x}}{x-3}\right)^{-1} =$$

$$= \frac{\left(\sqrt{x}+\sqrt{3}\right)^2 - \left(\sqrt{x}-\sqrt{3}\right)^2}{\left(\sqrt{x}-\sqrt{3}\right)\left(\sqrt{x}+\sqrt{3}\right)} \cdot \frac{x-3}{x\sqrt{3x}} =$$

$$= \frac{x + 2\sqrt{3x} + 3 - (x - 2\sqrt{3x} + 3)}{\cancel{x-3}} \cdot \frac{\cancel{x-3}}{x\sqrt{3x}} =$$

$$= \frac{\cancel{x} + 2\sqrt{3x} + \cancel{3} - \cancel{x} + 2\sqrt{3x} - \cancel{3}}{x\sqrt{3x}} = \frac{4\sqrt{3x}}{x\sqrt{3x}} = \frac{4}{x} =$$

$$= 4 : 27 = 108.$$

12) $$\frac{x+9}{x-9}$$

$$\left(= \frac{x+9}{x-9}\right.$$

$$= \frac{x+9}{x-9}$$

$$= \frac{x+9}{\cancel{x-9}}$$

$$\frac{\sqrt{x}(x+9)}{2(x+9)} =$$

12) $\frac{x+9}{x-9}\left(\frac{\sqrt{x}+3}{x-3\sqrt{x}}+\frac{\sqrt{x}-3}{x+3\sqrt{x}}\right)^{-1}=$

$=\frac{x+9}{x-9}\left(\frac{(\sqrt{x}+3)^2(x+3\sqrt{x})+(\sqrt{x}-3)(}{(x-3\sqrt{x})(x+3\sqrt{x})}\right)$

$=\frac{x+9}{x-9}\cdot\left(\frac{(\sqrt{x}+3)^2+(\sqrt{x}-3)^2}{\sqrt{x}(\sqrt{x}-3)(\sqrt{x}+3)}\right)^{-1}=$

$=\frac{x+9}{x-9}\cdot\frac{\sqrt{x}(x-9)}{\sqrt{x}\,x+6\sqrt{x}+9+x-6\sqrt{x}+9}=$

$\frac{\sqrt{x}(x+9)}{2(x+9)}=\frac{\sqrt{x}}{2}=\sqrt{\frac{1}{16}}\cdot\frac{1}{2}=\frac{1}{8}\quad\frac{1}{4}\cdot\frac{1}{2}=\frac{1}{8}$

13) $\left(\frac{\sqrt{x}}{x-7} + \frac{\sqrt{x}}{(\sqrt{x}-\sqrt{7})^2}\right) \cdot \frac{x^2-14x+49}{\sqrt{x}+\sqrt{7}} =$

$= \left(\frac{\sqrt{x}}{\sqrt{x^2}-\sqrt{7}^2} + \frac{\sqrt{x}}{(\sqrt{x}-\sqrt{7})^2}\right) \cdot \frac{(x-7)^2}{\sqrt{x}+\sqrt{7}} =$

$= \left(\frac{\sqrt{x}}{(\sqrt{x}+\sqrt{7})(\sqrt{x}+\sqrt{7})} + \frac{\sqrt{x}}{(\sqrt{x}-\sqrt{7})^2}\right) \cdot \frac{(x-7)^2}{\sqrt{x}+\sqrt{7}} =$

$= \left(\frac{\sqrt{x}(\sqrt{x}-\sqrt{7}) + \sqrt{x}(\sqrt{x}+\sqrt{7})}{(\sqrt{x}-\sqrt{7})^2 \cdot (\sqrt{x}+\sqrt{7})}\right) \cdot \frac{(x-7)^2}{\sqrt{x}+\sqrt{7}} =$

$= \frac{2x}{(\sqrt{x}-\sqrt{7})(x-7)} \cdot \frac{(x-7)^2}{\sqrt{x}+\sqrt{7}} =$

$= \frac{2x(x-7)}{x-7} = 2x = 26$

14)

14)

$$14)\left(\frac{x}{(\sqrt{x}-\sqrt{3})^2}-\frac{x}{x-3}\right)\frac{x^2-6x+9}{\sqrt{3x}+3}=$$

$$=\frac{x-x(1)}{(\sqrt{x}+\sqrt{3})^2}:\left(\frac{x}{(\sqrt{x}-\sqrt{3})^2}\right)$$

$$=\left(\frac{x}{(\sqrt{x}-\sqrt{3})^2}-\frac{x}{(\sqrt{x}-\sqrt{3})(\sqrt{x}+\sqrt{3})}\right)\frac{x^2-6x+9}{\sqrt{3x}+3}=$$

$$=\left(\frac{x(\sqrt{x}+\sqrt{3})-x(\sqrt{x}-\sqrt{3})}{(\sqrt{x}-\sqrt{3})^2(\sqrt{x}+\sqrt{3})}\right)\cdot\frac{(x-3)^2}{\sqrt{3}(\sqrt{x}+\sqrt{3})}=$$

$$=\frac{x(\sqrt{x}+\sqrt{3}-\sqrt{x}+\sqrt{3})}{(\sqrt{x}-\sqrt{3})^2(\sqrt{x}+\sqrt{3})}\cdot\frac{(x-3)^2}{\sqrt{3}(\sqrt{x}+\sqrt{3})}=$$

$$=\frac{2\sqrt{3}x}{(x-3)(\sqrt{x}-\sqrt{3})}\cdot\frac{(x-3)^2}{\sqrt{3}(\sqrt{x}+\sqrt{3})}=$$

$$= \frac{2\cdot\sqrt{3}x\ (x-3)}{\sqrt{3}(\sqrt{x}-\sqrt{3})^2} = \frac{2\sqrt{3}x}{\sqrt{3}} = \frac{42}{\sqrt{3}} = 14$$

$$\sqrt{3}\,(x-3)$$

15) $$\frac{(\sqrt[4]{x}+\sqrt{3})^2+(\sqrt[4]{x}-\sqrt{3})^2}{2(x-9)} : \frac{9}{x(\sqrt{x}-3)} =$$

$$= \frac{\sqrt{x}+2\sqrt[4]{x}\cdot\sqrt{3}+3+\sqrt{x}-2\sqrt[4]{x}\cdot\sqrt{3}+3}{2(x-9)} \cdot \frac{x(\sqrt{x}-3)}{9} =$$

$$= \frac{2x(\sqrt{x}+3)(\sqrt{x}-3)}{18(x-9)} = \frac{2x\ (x-9)}{\frac{18}{9}(x-9)} =$$

$$= \frac{x}{9} = 4$$

16)

16) $\left(\frac{2+\sqrt[4]{x}}{2-\sqrt[4]{x}}+\frac{2-\sqrt[4]{x}}{2+\sqrt[4]{x}}\right)\cdot\left(4\sqrt{x^{-\frac{1}{2}}}-1\right)\cdot x^{\frac{3}{4}}=$

$=\frac{(2+\sqrt[4]{x})(2+\sqrt[4]{x})-(2-\sqrt[4]{x})(2-\sqrt[4]{x})}{4-\sqrt{x}}\cdot\left(4\sqrt{x}-1\right)\cdot\sqrt[4]{x^3}=$

$=\frac{4+4\sqrt[4]{x}+\sqrt{x}-(4-4\sqrt[4]{x}+\sqrt{x})}{4-\sqrt{x}}\cdot\left(4\sqrt{x^{\frac{1}{2}}}-1\right)\sqrt[4]{x^3}=$

$\sqrt{x}-3)=$

$=\frac{4+4\sqrt[4]{x}+\sqrt{x}-4+4\sqrt[4]{x}+\sqrt{x}}{4-\sqrt{x}}\cdot\left(4\sqrt{x^{\frac{1}{2}}}-1\right)\sqrt[4]{x^3}=$

$=\frac{8\sqrt[4]{x}}{4-\sqrt{x}}\cdot\left(4\sqrt{x^{\frac{1}{2}}}-1\right)\cdot\sqrt[4]{x^3}=$

$=\frac{8\sqrt[4]{x}}{4-\sqrt{x}}\cdot\left(\frac{4}{\sqrt{x}}-1\right)\cdot\sqrt[4]{x^3}=$

$=\frac{8\sqrt[4]{x}}{4-\sqrt{x}}\cdot\frac{4-\sqrt{x}}{\sqrt{x}}\cdot\sqrt[4]{x^3}=8\cdot$

$=8\cdot x^{\frac{1}{4}-\frac{1}{2}+\frac{3}{4}}=8x^{\frac{1}{2}}=8\sqrt{x}=40$

17) $\frac{\sqrt[3]{x}\,(x-1)}{(\sqrt{x}+\sqrt[3]{x})(\sqrt[3]{x}-1)} \cdot \frac{x(\sqrt{x}-x)}{+\sqrt{x}} =$

$= \frac{\sqrt[4]{x}\,(x-1)}{\sqrt[3]{x}\,(\sqrt[4]{x^3}+1)(\sqrt[3]{x}-1)} \cdot \frac{\sqrt[3]{x}\,(1-\sqrt{x})}{\sqrt[3]{x}} =$

$= \frac{x-1}{\sqrt{x}-1} \cdot (-x(\sqrt{x}-1)) = -x^2 = -42$

18) $\frac{\sqrt{x}\,(x-2)}{(\sqrt{x}-\sqrt{2})(x+2\sqrt{2x}+2)} + \frac{\sqrt{2}}{\sqrt{x}+\sqrt{2}} + x =$

$= \frac{\sqrt{x}\,(x-2)}{(\sqrt{x}-\sqrt{2})(\sqrt{x}+\sqrt{2})(\sqrt{x}+\sqrt{2})} + \frac{\sqrt{2}}{\sqrt{x}+\sqrt{2}} + x =$

$= \frac{\sqrt{x}\,(x-2)}{(\sqrt{x}+\sqrt{2})(x-2)} + \frac{\sqrt{2}}{\sqrt{x}+\sqrt{2}} + x =$

$$= \frac{\sqrt{x}+\sqrt{2}+x(\sqrt{x}+\sqrt{2})}{\sqrt{x}+\sqrt{2}} = \frac{(\sqrt{x}+\sqrt{2})(x+1)}{\sqrt{x}+\sqrt{2}} =$$

$$= 19+1 = 20$$

19) $$\frac{x-1}{x+\sqrt{x}+1} : \frac{\sqrt{x}+1}{x\sqrt{x}-1} + 2\sqrt{x} =$$

$$= \frac{x-1}{x+\sqrt{x}+1} \cdot \frac{(\sqrt{x}-1)(\sqrt{x}+x+1)}{\sqrt{x}+1} + 2\sqrt{x} =$$

$$= \frac{(x-1)(\sqrt{x}+1)(\sqrt{x}-1)+2\sqrt{x}(\sqrt{x}+1)}{\sqrt{x}+1} =$$

$$= ((x-1)(x-1)+2x+$$

$$= \frac{(\sqrt{x}+1)((x-1)(\sqrt{x}-1)+2\sqrt{x})}{\sqrt{x}+1} =$$

$$= x\sqrt{x}-x-\sqrt{x}+1+2\sqrt{x} = x\sqrt{x}-x-\sqrt{x}+1 =$$

=

19) $\frac{x-1}{x+\sqrt{x}+1} : \frac{\sqrt{x}+1}{x\sqrt{x}-1} + 2\sqrt{x} =$

$= \frac{(\sqrt{x}-1)(\sqrt{x}+1)}{x+\sqrt{x}+1} \cdot \frac{(\sqrt{x}-1)(x+\sqrt{x}+1)}{\sqrt{x}+1} + 2\sqrt{x} =$

$= (\sqrt{x}-1)^2 + 2\sqrt{x} = x - 2\sqrt{x} + 1 + 2\sqrt{x} = x + 1 =$

$= 27.$

20) $\left(1 + \frac{2}{\sqrt{x}} + \frac{4}{x}\right)\left(1 - \frac{2}{\sqrt{x}}\right) \cdot \frac{x\sqrt{x}+8}{\sqrt{x}} =$

$= \left(\frac{x+2\sqrt{x}+4}{x}\right)\left(\frac{\sqrt{x}-2}{\sqrt{x}}\right) \cdot \frac{\sqrt{x}^3+2^3}{\sqrt{x}} =$

$= \frac{(\sqrt{x}^3-2^3)(\sqrt{x}^3+2^3)}{x^2} = \frac{(\sqrt{x}^3)^2-(2^3)^2}{x^2} =$

$= \frac{x^3-64}{x^2} = -14$

21) $\frac{x\sqrt{x}}{x-2\sqrt{}}$

$= \left(\frac{(\sqrt{x}}{x-2}\right.$

$= \frac{(\sqrt{x}+}{x}$

$= (\sqrt{x}+$

22) $\frac{\sqrt[4]{x}}{1}$

$= \frac{\sqrt[4]{x}-}{1-\sqrt{}}$

$= \frac{\sqrt[4]{x}(1}{1-}$

$= \sqrt[4]{x}$

$= x - 1$

21) $\frac{x\sqrt{x}+8}{x-2\sqrt{x}+4} : \frac{x+2\sqrt{x}+4}{x\sqrt{x}-8} =$

$= \left(\frac{(\sqrt{x})^3+2^3}{x-2\sqrt{x}+4} \cdot (\sqrt{x}-2)\right)$

$= \frac{(\sqrt{x}+2)(\cancel{x-2\sqrt{x}+4})}{\cancel{x-2\sqrt{x}+4}} \cdot \frac{(\sqrt{x}-2)(\cancel{x+2\sqrt{x}+4})}{\cancel{x+2\sqrt{x}+4}} =$

$= (\sqrt{x}+2)(\sqrt{x}-2) = x-4 = 1$

22) $\frac{\sqrt[4]{x}-\sqrt{x}}{1-\sqrt{x}} \left(1+\frac{2}{\sqrt[4]{x}-1}\right)\left(x-\sqrt[4]{x^3}\right) =$

$= \frac{\sqrt[4]{x}-\sqrt{x}}{1-\sqrt{x}} \cdot \left(\frac{\sqrt[4]{x}+1}{\sqrt[4]{x}-1}\right)\left(\sqrt[4]{x}^4-\sqrt[4]{x}^3\right) =$

$= \frac{\sqrt[4]{x}(1-\sqrt[4]{x})}{1-\sqrt{x}} \cdot \frac{(\sqrt[4]{x}+1)}{\sqrt[4]{x}-1} \cdot \sqrt[4]{x}^3(\sqrt[4]{x}-1) =$

$= \frac{\sqrt[4]{x}(1-\sqrt{x})}{1-\sqrt{x}} \cdot \sqrt[4]{x}^3 = x\frac{(1-\sqrt{x})}{1-\sqrt{x}} =$

$= x = 17.$

23) $x\left(\frac{\sqrt{x}+1}{x-\sqrt{x}}-\frac{\sqrt{x}-1}{x+\sqrt{x}}\right):\left(\frac{\sqrt{x}}{x-\sqrt{x}}-\frac{\sqrt{x}}{x+\sqrt{x}}\right)=$

$=x\left(\frac{(\sqrt{x}+1)^2-(\sqrt{x}-1)^2}{\sqrt{x}(\sqrt{x}-1)(\sqrt{x}+1)}\right):\left(\frac{\sqrt{x}(\sqrt{x}+1)-\sqrt{x}(\sqrt{x}-1)}{\sqrt{x}(\sqrt{x}+1)(\sqrt{x}-1)}\right)$

$=x\left(\frac{(x+1)^2\cdot x^2+2\sqrt{x}+1-x^2+2\sqrt{x}-1}{\sqrt{x}(\sqrt{x}-1)(\sqrt{x}+1)}\cdot\frac{\sqrt{x}(\sqrt{x}+1)(\sqrt{x}-1)}{x+\sqrt{x}-x+\sqrt{x}}\right)$

$=x\left(\frac{4\sqrt{x}}{2\sqrt{x}}\right)=2x=12.$

24. $(\sqrt[4]{x}-\sqrt[4]{2})(\sqrt{x^3}+\sqrt{8}):\frac{x-\sqrt{2x}+2}{\sqrt[4]{x}+\sqrt[4]{2}}=$

$=(\sqrt[4]{x}-\sqrt[4]{2})(\sqrt{x}+\sqrt{2})(x-\sqrt{2x}+2)\cdot\frac{\sqrt[4]{x}+\sqrt[4]{2}}{x-\sqrt{2x}+2}=$

$=(\sqrt{x}-\sqrt{2})(\sqrt{x}+\sqrt{2})=x-2=21-2=19$

25)

26

25) $\frac{(x+2\sqrt{2x}+2)(\sqrt{x}-\sqrt{2})}{x-2} \cdot \left(\frac{\sqrt{2x}}{\sqrt{x}+\sqrt{2}} - \sqrt{2}\right) + x =$

$= \frac{(\sqrt{x}+\sqrt{2})(\sqrt{x}+\sqrt{2})(\sqrt{x}-\sqrt{2})}{x-2} \cdot \frac{\sqrt{2x}-\sqrt{2}(\sqrt{x}+\sqrt{2})}{\sqrt{x}+\sqrt{2}} + x$

$= \left(\frac{(\sqrt{x}+\sqrt{2})(x-2)}{x-2} \cdot \frac{\sqrt{2x}-\sqrt{2x}-2}{\sqrt{x}+\sqrt{2}}\right) + x =$

$= x - 2 = 8.$

26) $\frac{x\sqrt{x}-1}{\sqrt{x}+1} \cdot \frac{x-1}{x+\sqrt{x}+1} \left(\frac{2\sqrt{x}}{(\sqrt{x}-1)^2} + 1\right) =$

$= \frac{(\sqrt{x}-1)(x+\sqrt{x}+1)}{\sqrt{x}+1} \cdot \frac{x-1}{x+\sqrt{x}+1} \left(\frac{2\sqrt{x}+(\sqrt{x}-1)^2}{(\sqrt{x}-1)^2}\right) =$

$= \frac{(\sqrt{x}-1)(\sqrt{x}-1)(\sqrt{x}+1)}{\sqrt{x}+1} \cdot \frac{2\sqrt{x}+(\sqrt{x}-1)^2}{(\sqrt{x}-1)^2} =$

$= 2\sqrt{x} + x - 2\sqrt{x} + 1 = x + 1 = 18.$

27) $\frac{(\sqrt[3]{x^2}-1)(\sqrt[3]{x^2}+\sqrt{x}+1)}{\sqrt[3]{x}+1} =$

$= \frac{(\sqrt[3]{x}-1)(\sqrt[3]{x}+1)\cdot(\sqrt[3]{x^2}+\sqrt{x}+1)}{\sqrt[3]{x}+1} =$

$= x - 1 = 6 - 1 = 5$

28) $\left((\sqrt[4]{x}-1)^{-2}+(\sqrt[4]{x}+1)^{-2}\right):\left(\frac{\sqrt{x}+1}{x-1}\right)^3 =$

$= \frac{1}{\sqrt{x}-1}\cdot\frac{(x-1)^3}{(\sqrt{x}+1)^3} =$

$= \frac{(x-1)^{3\cdot 2}}{(x-1)(\sqrt{x}-1)^2}\cdot\frac{(\sqrt{x}-1)^2(\sqrt{x}+1)^2}{(\sqrt{x}-1)^2} =$

$= x + 2\sqrt{x} + 1 = 7 + 2\cdot 7^{\frac{1}{2}} + 1$

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~~(62)~~

62) $(2a^2-a)x+1=a^2+x$

$(2a^2-a)x-x=a^2-1$

$x(2a^2-a-1)=a^2-1$

$2a^2-a-1=0$

$D=b^2-4ac=1+8=9$

$a_{1;2}=\frac{1\pm3}{4}=1;-0,5$

$x=\frac{a^2-1}{2a^2-a-1}=\frac{a^2-1}{2(a-1)(a+0,5)}=$

$=\frac{(a-1)(a+1)}{2(a-1)(a+0,5)}=\frac{a+1}{2a+1}$ $\Rightarrow$ $2a+1\neq0$

$a\neq-0,5$

63) $-4ax+3=3a-(a^2+3)x$

$-4ax+(a^2+3)x=3a-3$

$x(-4a+a^2+3)=3(a-1)$

$a^2-4a+3=0$

$D=16-12=4$

$a_{1;2}=\frac{4\pm2}{2}=3;1$

$x=\frac{3(a-1)}{a^2-4a-3}=\frac{3(a-1)}{(a-3)(a-1)}=$

$=\frac{3}{a-3}$ $\Rightarrow$ $a-3\neq0$

$a\neq3$

64) $1+x = a^2x - a$

$a^2x - x = a + 1$

$x(a^2-1) = a+1$

$x = \frac{a+1}{(a+1)(a-1)} = \frac{1}{a-1} \Rightarrow$ ~~1~~ $a-1 \neq 0$

$a \neq 1$

65) $2a - 4 + 4x = a^2x$

$a^2x - 4x = 2a - 4$

$x(a^2-4) = 2(a-2)$

$x = \frac{2(a-2)}{(a-2)(a+2)} = \frac{2}{a+2} \Rightarrow a+2 \neq 0$

$a \neq -2$

4г

1) $\begin{cases} 2x + ay = 8 \\ 3x - 5y = 6 \end{cases} \begin{matrix} \\ | \cdot 2 \end{matrix} \Rightarrow \begin{cases} -6x - 3ay = -24 \\ 6x - 10y = 12 \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} -6x + 6x - 3ay - 10y = -24 + 12 \Rightarrow \end{cases}$

$\Rightarrow -(3ay + 10y) = -12 \Rightarrow 3ay + 10y = 12 \Rightarrow$

$\Rightarrow y(3a+10)=12$

$y=\frac{12}{3a+10}$

$3a+10\neq 0$

$3a\neq -10$

$a\neq -\frac{10}{3}$ *

2) $\begin{cases} 3x+(a+5)y=-11 \\ x+4y-7=0 \end{cases} \Big| -3 \Big| \Rightarrow \begin{cases} 3x+(a+5)y=-11 \\ -3x-12y+21=0 \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} 3x+(a+5)y=-11 \\ -3x-12y=-21 \end{cases} \Rightarrow y(a+5)-12y=-33 \Rightarrow$

$\Rightarrow ay+5y-12y=-33 \Rightarrow ay-7y=-33$

$y(a-7)=-33$

$y=\frac{-33}{a-7.}=\frac{33}{7-a}$ | $7-a\neq 0$, $a\neq 7$

3) $\begin{cases} 4x+3y=12 \\ 2x+ay=5 \end{cases} \Big| -2 \Big| \Rightarrow \begin{cases} 4x+3y=12 \\ -4x-2ay=-10 \end{cases} \Rightarrow$

$\Rightarrow 3y-2ay=2 \Rightarrow y(3-2a)=2$

$y=\frac{2}{3-2a}$ | $3-2a\neq 0$, $a\neq \frac{-3}{-2}$, $a\neq \frac{3}{2}$

4) $\begin{cases} 3x+8y=10 \\ x-ay=7 \end{cases} \Big| \cdot(-3) \Rightarrow \begin{cases} 3x+8y=10 \\ -3x+ay=-21 \end{cases} \Rightarrow$

$\Rightarrow \quad 8y+ay=-17.$

$y(8+a)=-17$

$y=\frac{-17}{8+a}=\frac{17}{a-8}$

$a-8\neq 0$

$a\neq 8$

5) $\begin{cases} x+y=1 \\ ax-5y=2 \end{cases} \Big| \cdot 5 \Rightarrow \begin{cases} 5x+5y=5 \\ ax-5y=2 \end{cases} \Rightarrow \begin{cases} 5x+ax=7 \Rightarrow \end{cases}$

$\Rightarrow x(5+a)=7$

$x=\frac{7}{5+a}$

$5+a\neq 0$

$a\neq -5$

6) $\begin{cases} 4x-3y=a \\ x-ay=0 \end{cases} \Rightarrow \begin{cases} 4x-3y=a \\ -4x+4ay=0 \end{cases} \Rightarrow$

$$\Rightarrow \begin{cases} 4ay - 3y = a \\ \end{cases} \Rightarrow y(4a-3) = a \;\Big|\; 4a-3 \neq 0,\ a \neq \frac{3}{4}$$

$$y = \frac{a}{4a-3}$$

7) $$\begin{cases} mx + ny = 8 \\ 5x + 3y = 4 \end{cases} \Big| \cdot 2 \Big| \Rightarrow \begin{cases} mx + ny = 8 \\ 10x + 6y = 8 \end{cases} \Rightarrow mx + ny = 10x + 6y \Rightarrow$$

$$\Rightarrow m = 10$$

$$n = 6$$

8) $$\begin{cases} mx + y = n \\ 2x + 3y = 8 \end{cases} \Big| \cdot 3 \Big| \Rightarrow \begin{cases} 3mx + 3y = 3n \\ 2x + 3y = 8 \end{cases} \Rightarrow \begin{cases} 3y = 3n - 3mx \\ 3y = 8 - 2x \end{cases} \Rightarrow$$

$$\Rightarrow 3n - 3mx = 8 - 2x \Rightarrow 3n = 8 \Rightarrow n = \frac{8}{3}$$

$$3m = 2 \Rightarrow m = \frac{2}{3}$$

9) $$\begin{cases} mx + (n-1)y = 2 \\ 3x + 10y = -1 \end{cases} \Rightarrow \begin{cases} mx + ny - y = 2 \\ 3x + 10y = -1 \end{cases} \Rightarrow \Big| \begin{matrix} -10 \\ -2 \end{matrix} \Big|$$

$$\Rightarrow \begin{cases} -10mx - 10ny + 10y = -20 \\ 3x + 10y = -1 \end{cases} \Rightarrow +10mx + 10ny - 20 = -3x - 1$$

$$\Rightarrow \begin{cases} mx + ny - y = 2 \\ -6x - 20y = 2 \end{cases} \Rightarrow mx + ny - y = -6x - 20y \Rightarrow$$

$$\Rightarrow \quad m = -6$$

$$y(n-1) = -20y$$

$$n - 1 = -20$$

$$n = -19$$

10) $\begin{cases} 2mx - 3ny = 3 \\ x + 6y = 2 \end{cases} \begin{vmatrix} 2 \\ 3 \end{vmatrix} \Rightarrow \begin{cases} 4mx - 6ny = 6 \\ 3x + 18y = 6 \end{cases} \Rightarrow$

$$\Rightarrow \begin{cases} 4mx - 6ny = 3x + 12y \Rightarrow \end{cases}$$

$$\Rightarrow 4m = 3 \Rightarrow m = \frac{3}{4}$$

$$-6n = 12$$

$$n = -2$$

11) $\begin{cases} -mx + (n+1)y = -1 \\ 3x - 6y = 4 \end{cases} \begin{vmatrix} \cdot 4 \\ \| \end{vmatrix} \Rightarrow \begin{cases} 4mx - 4y(n+1) = 4 \\ 3x - 6y = 4 \end{cases} \Rightarrow$

$$\Rightarrow 4mx - 4y(n+1) = 3x - 6y$$

12)

13) $\begin{cases} 5 \\ x \end{cases}$

16) $\begin{cases} 3 \\ 2 \end{cases}$

$\Rightarrow$

$4m = 3$

$m = \frac{3}{4}$

$-4(n+1) = -6$

$n+1 = \frac{3}{2}$

$n = \frac{1}{2}$

12) $\begin{cases} (m+1)x + 2ny = 3 \\ 5x + 2y = -1 \end{cases} \Big| \cdot(-3) \Rightarrow \begin{cases} (m+1)x + 2ny = 3 \\ -15x - 6y = 3 \end{cases} \Rightarrow$

$\Rightarrow (m+1)x + 2ny = -15x - 6y$

$(m+1) = -15$

$m = -16$

$2n = -6$

$n = -3$

13) $\begin{cases} 5x - 2y = 3 \\ x + y = a \end{cases} \Rightarrow \begin{cases} x = 0 \\ x = 0 \end{cases} \Rightarrow \begin{cases} -2y \neq 3 \\ y = a \end{cases} \Rightarrow \begin{cases} y = -\frac{3}{2} \\ a = -\frac{3}{2} = -1{,}5 \end{cases}$

16) $\begin{cases} 3x - y = -1 \\ 2x - y - 3a = 0 \end{cases} \Rightarrow \begin{cases} y = 0 \\ y = 0 \end{cases} \Rightarrow \begin{cases} x = -\frac{1}{3} \\ 2x = 3a \end{cases} \Rightarrow \begin{cases} x = -\frac{1}{3} \\ a = \frac{2x}{3} \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} x = -\frac{1}{3} \\ a = \frac{2}{3} \cdot \left(-\frac{1}{3}\right) = -\frac{2}{9} \end{cases}$

$x>0$

15) $\begin{cases} 4x-3y=-2 \\ 2x-y=a-1 \end{cases}$

$$\begin{array}{r|l} -7n & n-4 \\ \hline 7n-28 & 7 \\ \hline 28 & \end{array}$$

22) $(n-4)x=7n$

$$x = \frac{7n}{n-4} = 7+\frac{28}{n-4}$$

$$\begin{cases} n-4=\pm 1 \\ n-4=\pm 2 \\ n-4=\pm 4 \\ n-4=\pm 7 \\ n-4=\pm 14 \\ n-4=\pm 28 \end{cases}$$

$n-?$ $n\in Z$

$x\in Z$

23) $(n-1)\cdot x = n^2+1$

$$x = \frac{n^2+1}{n-1}$$

$$\begin{array}{r|l} -n^2+1 & n-1 \\ \hline n^2-n & n+1 \\ \hline -n+1 & \\ n-1 & \\ \hline 2 & \end{array}$$

$$x = n+1+\frac{2}{n-1}$$

$$\begin{cases} n-1=\pm 1 \\ n-1=\pm 2 \end{cases}$$

1

23.09.2005г.

№6

ш) $7x - 11 = 3$

$7x = 14$

$x = 2$

ф) $110x - 4 = 216$

$110x = 220$

$x = 2$

щ) $-4 = 6 - 2x$

$2x = 10$

$x = 5$

ъ) $4 - 6x = 4$

$6x = 0$

$x = 0$

ы) $-x - 4 = 8$

$x = -12$

ь) $1 + 3x = 10$

$3x = 9$

$x = 3$

э) $-1,1x + 12 = 1$

$1,1x = 11$

$x = 10$

ю) $1,5 - 2x = 3$

$2x = -1,5$

$x = -0,75$

№7.

ш) $6x - 8 = 10 - 3x$

$9x = 18$

$x = 2$

ф) $-x - 1,1 = 1,1x + 1$

$2,1x = -2,1$

$x = -1$

ъ) $2,2 - 3x = 1,1 - x$

$2x = 1,1$

$x = 0,55$

№8

ш) $x = x$

$x - x = 0$

$0 = 0$

ф) $x + x = x + x + x$

$2x = 3x$

$5x = 0$

$x = 0$

$-x = x$

$-2x = 0$

$x = 0$

№ 9

ш) $(2x-1)-(1-3x)=4x+3$

$2x-1-1+3x=4x+3$

$2x+3x-4x=3+1+1$

$x=5$

я) $-(1,5-0,1x)+2x=-(0,5x-1)+2$

$-1,5+0,1x+2x=-0,5x+1+2$

$0,1x+2x+0,5x=1+2+1,5$

$2,6x=4,5$

$x=1\frac{19}{26}$

з

г) $(5x+12)-(36-45x)=(48-3x)+(105x+6)$

$5x+12-36+45x=48+3x+105x+6$

$105x+3x-5x-45x=12-36-48-6$

$58x=-78$

$x=-1\frac{10}{29}$

№ 10

ш) $x-1=2x+1$

$x=-2$

к) $2x+5=x+11$

$x=6$

я) $10x-1=-7x+33$

$17x=34$

$x=2$

б) $10x-1=$

г) $3x-(10-5x)=50$

$3x-10+5x=50$

$8x=60$

$x=7\frac{1}{2}$

+2

2

Упр 11

(2x = 3x + 1)

ш) $2x - 1 = 3x$

$x = -1.$

л) $4x + 50 = 3x$

$x = -50$

ф) $\frac{x-1}{3} = 100x$

$x - 1 = 300x$

$299x = -1$

$x = -\frac{1}{299}$

э) $2(1-x) = 3(1-2x)$

$2 - 2x = 3 - 6x$

$4x = 1$

$x = \frac{1}{4}$

Упр 12

ш) $12(y-1) = 18,8 - 3,4y$

$12y - 12 = 18,8 - 3,4y$

$15,4y = 30,8$

$y = 2$

л) $0,6y - 1,5 = 3(y-4)$

$0,6y - 1,5 = 3y - 12$

$12 - 1,5 = 3y - 0,6y$

$10,5 = 2,4y$

$y = 4\frac{9}{24}$

Задача 13

x - I р/д

y - II р/д

$x - 30 = y$

$x + y = 140$

Пусть

x - 1 и y - 2

Решение

$x + y = 140$

$x + x - 30 = 140$

$2x = 170$

$x = 85$ р. — $y = x - 30 = 55$

Тапсырма 14

алтық – x

ұлпық y

x - 12 = y

x + y = 100

x; y - ?

x + y = 100

x + x - 12 = 100

2x = 88

x = 44

Тапсырма 15

x + y = 120

x = 2y

2y + y = 120

3y = 120

y = 40

x = 2y = 80

Жауабы: 40 және 80.

13.

(Ұш - 1)

x + y + z = 150

x = y + 6

x - 6 = y

x + 6 = z

x + y + z = 150

x + x - 6 + x + 6 = 150

x = 50

y = 44 ; z = 56

Жауабы: 44, 50, 56.

26

x - з збірки (1)

$y = x + 2$

$5x = z$

$x + z = 3y$

$x + z = 3y$.

$x + 5x = 3(x+2)$

$x + 5x - 3x = 6$

$3x = 6;\ x = 2$.

$y = 4;\ z = 10$

Відп: 2; 4; 10;

27.09.2005р.

$x = 4$

а) $\begin{cases} 2x - 3 > 0 \\ -3x + 2 > 0 \end{cases} \Rightarrow \begin{cases} 5 > 0 \\ -10 \not> 0 \end{cases}$

$\begin{cases} 2x - 3 \leq 0 \\ -3x + 2 \leq 0 \end{cases} \Rightarrow \begin{cases} 5 \not\leq 0 \\ -10 \leq 0 \end{cases}$

б) $\begin{cases} 1 - 5x \leq 8 \\ 9x - 2 \geq 3 \end{cases}$ и $\begin{cases} 1 - 5x > 8 \\ 9x - 2 < 3 \end{cases}$

$\begin{cases} 1 - 20 \leq 8 \\ 34 \geq 3 \end{cases}$ и $\begin{cases} -19 \not> 8 \\ 34 \not< 3. \end{cases}$

ө) $\begin{cases} 11+7x<2 \\ \end{cases}$

ш) $|x|=0$

1. $x<0$

2. $x \geq 0$

1. $\begin{cases} -x=0 \\ x<0 \end{cases} \Rightarrow \begin{cases} x=0 \\ x<0 \end{cases}$

дизъюнкция

2. $\begin{cases} x \geq 0 \\ x=0 \end{cases} \Rightarrow x=0$

ы) $|x|=5$

1. $x<0$

2 $x \geq 0$

1. $\begin{cases} x<0 \\ -x=5 \end{cases} \Rightarrow \begin{cases} x<0 \\ x=-5 \end{cases} \Rightarrow x=-5$

2. $\begin{cases} x \geq 0 \\ x=5 \end{cases} \Rightarrow x=5$

э) $-|x|=-2$

1. $x<0$

2. $x \geq 0$

1. $\begin{cases} x<0 \\ -(-x)=-2 \end{cases} \Rightarrow \begin{cases} x<0 \\ x=-2 \end{cases} \Rightarrow x=-2$

2. $\begin{cases} x \geq 0 \\ -|x| = -2 \end{cases} \Rightarrow \begin{cases} x \geq 0 \\ -x = -2 \end{cases} \Rightarrow \begin{cases} x \geq 0 \\ x = 2 \end{cases} \Rightarrow x = 2.$

ж) $|x| = -1.$

1. $x < 0$

2. $x \geq 0$

1. $\begin{cases} x < 0 \\ -x = -1 \end{cases} \Rightarrow \begin{cases} x < 0 \\ x = 1 \end{cases}$ $\Rightarrow$ ғизвш ғиғф.

2. $\begin{cases} x \geq 0 \\ x = -1. \end{cases} \Rightarrow$ ғизвш ғиғф.

ғиғф

2 ушд 8

и) $|x| + |x-1| = 0$

1. $x < 0$; $x - 1 < 0$

2. $x \geq 0$; $x - 1 < 0$

3. $x < 0$; $x - 1 \geq 0$

4. $x \geq 0$; $x - 1 \geq 0$

1. $\begin{cases} x < 0 \\ x - 1 < 0 \\ -x - x + 1 = 0 \end{cases} \Rightarrow \begin{cases} x < 0 \\ x - 1 < 0 \\ x = 0{,}5 \end{cases}$

ғизвш ғиғф.

2. $\begin{cases} x \geq 0 ; \\ x - 1 < 0 \\ x + x + 1 < 0 \end{cases} \Rightarrow$ ғиғ

ғиғ. ғиғф.

3. $\begin{cases} x < 0. \\ x - 1 \geq 0. \\ -x + x - 1 = 0 \end{cases}$

ғизвш ғиғф

-2.

4. $\begin{cases} x \geq 0 \\ x-1 \geq 0 \\ x+x-1=0 \end{cases} \Rightarrow \begin{cases} x \geq 0 \\ x-1 \geq 0 \\ x = 0{,}5 \end{cases}$ ⇒ ни на что не подх.

г) $|x| + |3x| = -3$

1. $x \geq 0$; $3x \geq 0$
2. $x \geq 0$; $3x < 0$
3. $x < 0$; $3x \geq 0$
4. $x < 0$; $3x < 0$

1. $\begin{cases} x \geq 0 \\ 3x \geq 0 \\ x+3x=-3 \end{cases} \Rightarrow \begin{cases} x \geq 0 \\ 3x \geq 0 \\ x = -\frac{3}{4} \end{cases}$

2. $\begin{cases} x \geq 0; (3x<0) \\ 3x < 0. \\ x-3x=-3 \end{cases} \Rightarrow \begin{cases} x \geq 0 \\ 3x < 0 \\ x = \frac{3}{2} \end{cases}$

3. $\begin{cases} x < 0 \\ 3x \geq 0 \\ -x+3x=-3 \end{cases} \Rightarrow \begin{cases} x < 0 \\ 3x \geq 0 \\ x = -\frac{3}{2} \end{cases}$

4. $\begin{cases} -x-3x<0 \\ 3x < 0 \\ -x-3x=-3 \end{cases} \Rightarrow \begin{cases} x < 0 \\ 3x < 0 \\ x = \frac{3}{4} \end{cases}$

$x \in \varnothing$

д) $|x-2| + |2$

1. $x-2<0$
2. $x-2 \geq 0$
3. $x-2<0$
4. $x-2 \geq 0$

2. $\begin{cases} x-2 \geq 0 \\ 2x-4<0 \\ x-2-2x \end{cases}$

3. $\begin{cases} x-2<0 \\ 2x-4 \\ -x+2+2 \end{cases}$

4. $\begin{cases} x-2 \geq 0 \\ 2x-4 \geqslant \\ x-2+2 \end{cases}$

9) $|x-2|+|2x-4|=0$

1. $x-2<0$; $2x-4<0$
2. $x-2\geq 0$; $2x-4<0$
3. $x-2<0$; $2x-4\geq 0$
4. $x-2\geq 0$; $2x-4\geq 0$

1. $\begin{cases} x-2<0 \\ 2x-4<0 \\ -x+2-2x+4=0 \end{cases} \Rightarrow \begin{cases} x-2<0 \\ 2x-4<0 \\ x=+2 \end{cases}$

$x\in\varnothing$

2. $\begin{cases} x-2\geq 0 \\ 2x-4<0 \\ x-2-2x+4=0 \end{cases} \Rightarrow \begin{cases} x-2\geq 0 \\ 2x-4<0 \\ x=2. \end{cases} \Rightarrow x\in\varnothing$

3. $\begin{cases} x-2<0 \\ 2x-4\geq 0 \\ -x+2+2x-4=0 \end{cases} \Rightarrow \begin{cases} x-2<0 \\ 2x-4\geq 0 \\ x=2. \end{cases} \Rightarrow x\in\varnothing$

4. $\begin{cases} x-2\geq 0 \\ 2x-4\geq 0 \\ x-2+2x-4=0 \end{cases} \Rightarrow \begin{cases} x-2\geq 0 \\ 2x-4\geq 0 \\ x=2 \end{cases} \Rightarrow x=2$

ж) $|1-x| + |2-2x| = -2$.

1. $1-x \geq 0$; $2-2x \geq 0$
2. $1-x < 0$; $2-2x \geq 0$
3. $1-x \geq 0$; $2-2x < 0$
4. $1-x < 0$; $2-2x < 0$

1. $\begin{cases} 1-x \geq 0 \\ 2-2x \geq 0 \\ 1-x+2-2x = -2 \end{cases} \Rightarrow \begin{cases} 1-x \geq 0 \\ 2-2x \geq \\ x = \frac{5}{3} \end{cases}$

$x \in \varnothing$

2. $\begin{cases} 1-x < 0 \\ 2-2x \geq 0 \\ -1+x+2-2x = 0 \end{cases} \Rightarrow \begin{cases} 1-x < 0 \\ 2-2x \geq 0 \\ x = 1 \end{cases} \Rightarrow x \in \varnothing$

3. $\begin{cases} 1-x \geq 0 \\ 2-2x < 0 \\ 1-x-2+2x = -2 \end{cases} \Rightarrow \begin{cases} 1-x \geq 0 \\ 2-2x < 0 \\ x = 3 \end{cases} \Rightarrow x \in \varnothing$

4. $\begin{cases} 1-x < 0 \\ 2-2x < 0 \\ -1+x-2+2x = -2 \end{cases} \Rightarrow \begin{cases} 1-x < 0 \\ 2-2x < 0 \\ x = \frac{1}{3} \end{cases} \Rightarrow x \in \varnothing$

з) $|x-2| =$

1. $x-2 < 0$
2. $x-2 \geq 0$

и) $|5-3x| = 10$

1. $5-3x < 0$
2. $5-3x \geq 0$

к) $|5-3x| =$

1. $5-3x \geq$
2. $5-3x$

Умр 9

ш) $|x-2|=2$

1. $x-2<0$

2. $x-2\geq 0$

1. $\begin{cases} x-2<0 \\ -x+2=2 \end{cases} \Rightarrow \begin{cases} x-2<0 \\ x=0 \end{cases} \Rightarrow x=0$

2. $\begin{cases} x-2\geq 0 \\ x-2=2 \end{cases} \Rightarrow \begin{cases} x-2\geq 0 \\ x=4 \end{cases} \Rightarrow x\in\varnothing$

ы) $|5-3x|=10$

1. $5-3x<0$

2. $5-3x\geq 0$

1. $\begin{cases} 5-3x<0 \\ -5+3x=10 \end{cases} \Rightarrow \begin{cases} 5-3x<0 \\ x=5 \end{cases} \Rightarrow x=5$

2. $\begin{cases} 5-3x\geq 0 \\ 5-3x=10 \end{cases} \Rightarrow \begin{cases} 5-3x\geq 0 \\ x=-\frac{5}{3} \end{cases} \Rightarrow x=-\frac{5}{3}$

э) $|5-3x|=x$

1. $5-3x\geq 0$

2. $5-3x<0$

1. $\begin{cases} 5-3x\geq 0 \\ 5-3x=x \end{cases} \Rightarrow \begin{cases} 5-3x\geq 0 \\ x=\frac{5}{4} \end{cases} \Rightarrow x=\frac{5}{4}$

2. $\begin{cases} 5-3x<0 \\ -5+3x=x \end{cases} \Rightarrow \begin{cases} 5-3x<0 \\ x=\frac{2}{5} \end{cases} \Rightarrow x\in\varnothing$

ж) $|4x-2|=3$

1. $4x-2 \geq 0$
2. $4x-2 \leq 0$

1. $\begin{cases} 4x-2 \geq 0 \\ 4x-2=3 \end{cases} \Rightarrow \begin{cases} 4x-2 \geq 0 \\ x=\frac{5}{4} \end{cases} \Rightarrow x=\frac{5}{4}$

2. $\begin{cases} 4x-2<0 \\ -4x+2=3 \end{cases} \Rightarrow \begin{cases} 4x-2<0 \\ x=-\frac{1}{4} \end{cases} \Rightarrow x=-\frac{1}{4}$

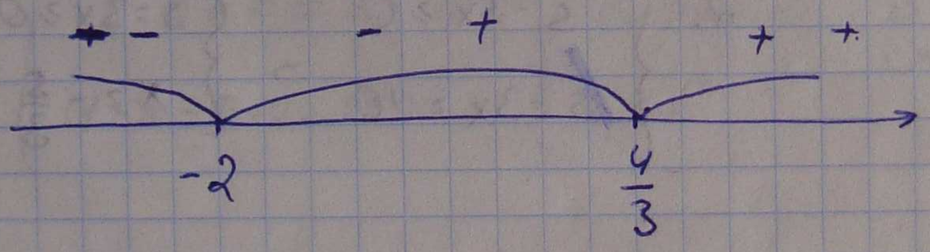
ужгд 4.

$3x-4=0$

$x=\frac{4}{3}$

$4x+8=0$

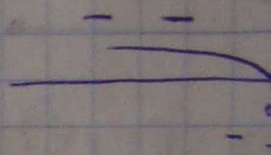
$x=-2$



Ответ $\begin{cases} 3x-4>0 \\ 4x+8>0 \end{cases} \Rightarrow x \in \left(\frac{4}{3}; \infty\right)$

ф) $4x+7=0$

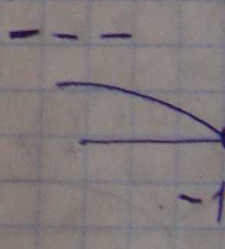
$x=-\frac{7}{4}$



$\begin{cases} 4x+7>0 \\ 6x-11 \end{cases}$

з) $x+12=0$

$x=-12$



$\begin{cases} x+12>0 \\ 2x+23>0 \\ 3x-14>0 \end{cases}$

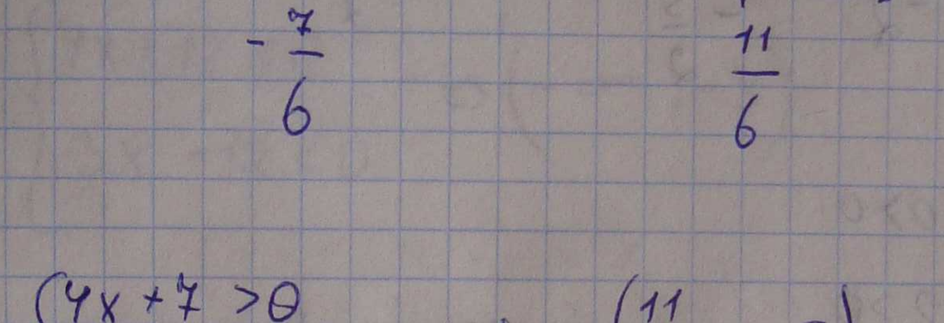
$-2 \geq 0$

$\geq \frac{5}{4}$ e) $x \geq \frac{5}{4}$

$\frac{1}{4}$.

f) $4x + 7 = 0$ $\quad 6x - 11 = 0$

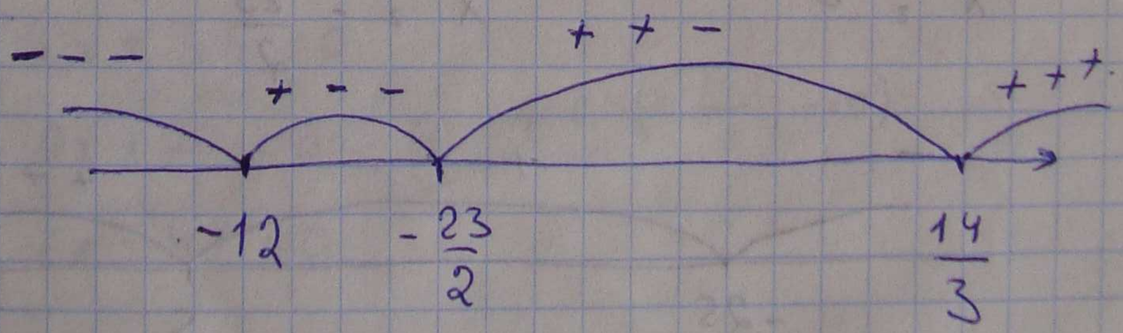
$x = -\frac{7}{4}$ $\quad x = \frac{11}{6}$



$$\begin{cases} 4x + 7 > 0 \\ 6x - 11 > 0 \end{cases} \Rightarrow x \in \left(\frac{11}{6}; \infty\right)$$

g) $x + 12 = 0$ $\quad 2x + 23 = 0$ $\quad 3x - 14 = 0$

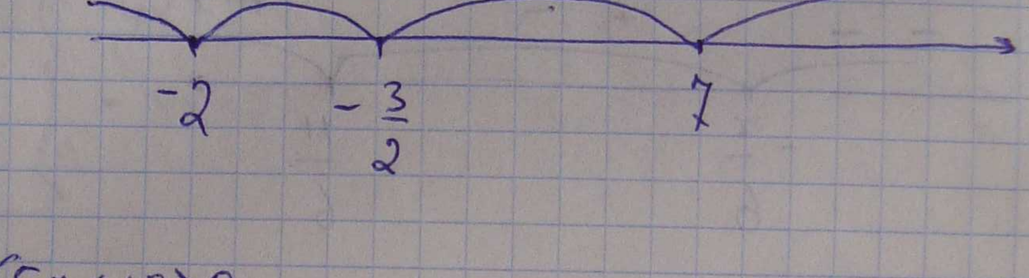
$x = -12$ $\quad x = -\frac{23}{2}$ $\quad x = \frac{14}{3}$



$$\begin{cases} x + 12 > 0 \\ 2x + 23 > 0 \\ 3x - 14 > 0 \end{cases} \Rightarrow x \in \left(\frac{14}{3}; \infty\right)$$

г) $5x+10=0$ $8x+12=0$ $2x-14=0$ $3x-21=0$

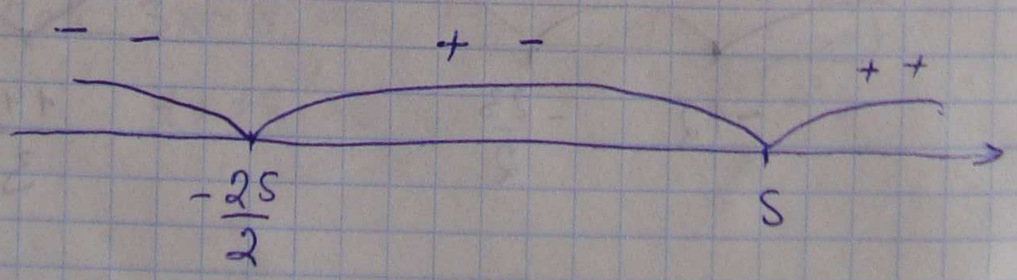
$x=-2$ $x=-\frac{3}{2}$ $2x=7$ $x=\frac{21}{3}=7$



$$\begin{cases} 5x+10\geq 0 \\ 8x+12>0 \\ 2x-14>0 \\ 3x-21>0 \end{cases} \Rightarrow x\in(7;\infty)$$

ж) $0,5x-2,5=0$ $0,8x+10=0$

$x=5$ $x=-\frac{25}{2}$



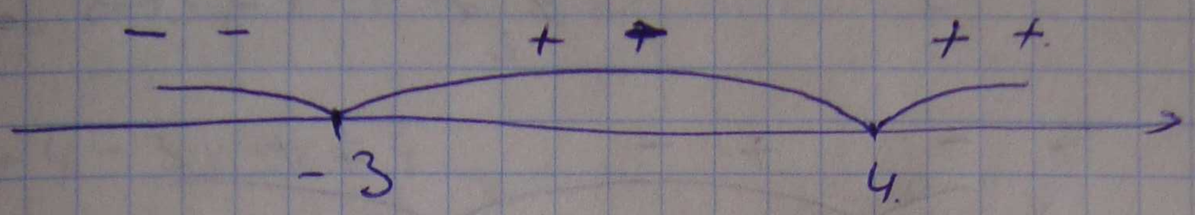
$$\begin{cases} 0,5x-2,5<0 \\ 0,8x+10<0 \end{cases} \Rightarrow x\in\left(-\infty;-\frac{25}{2}\right)$$

$=0$

$\frac{21}{3}=7$

а) $4x+12=0$ $\quad 3x-12=0$

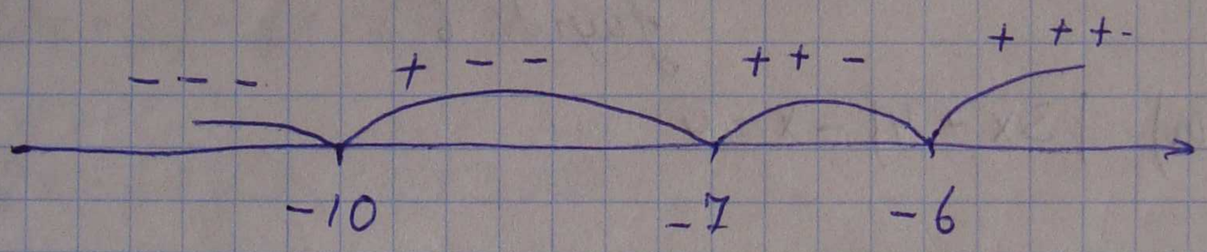
$x=-3$ $\quad x=4$



$$\begin{cases} 4x+12<0 \\ 3x-12<0 \end{cases} \Rightarrow (-\infty;-3)$$

б) $6x+36=0$ $\quad 2x+20=0$ $\quad 7x-49=0$

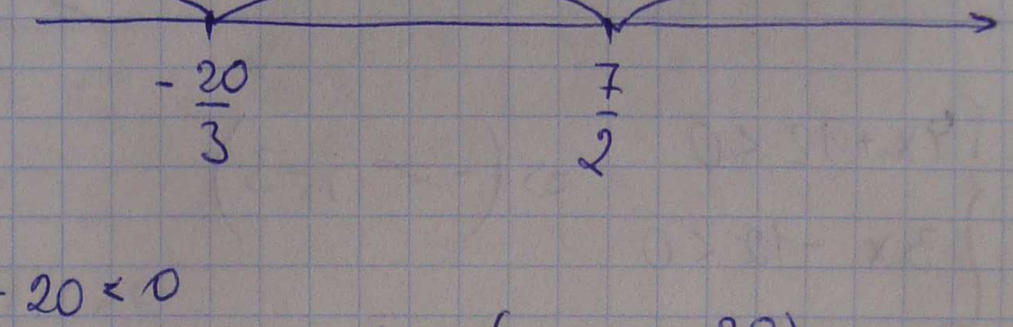
$x=-6$ $\quad x=-10$ $\quad x=7$



$$\begin{cases} 6x+36<0 \\ 2x+20<0 \\ 7x-49<0 \end{cases} \Rightarrow x \in (-\infty;-10)$$

ж) $3x+20=0$ $\quad 4x-14=0$ $\quad 8x-28=0$

$x=-\frac{20}{3}$ $\quad x=\frac{14}{4}=\frac{7}{2}$ $\quad x=\frac{28}{8}=\frac{7}{2}$



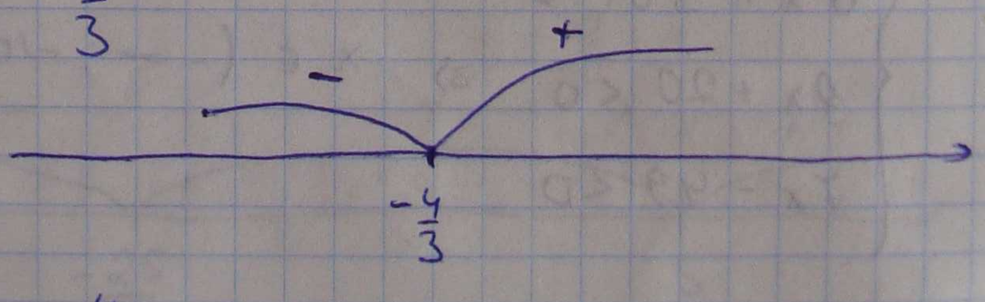
$$\begin{cases} 3x+20<0 \\ 4x-14<0 \\ 8x-28<0 \end{cases} \Rightarrow x\in\left(-\infty;-\frac{20}{3}\right).$$

Фигуд 6

и) $|3x+4|-x=4$

$3x+4=0$

$x=-\frac{4}{3}$



$x<-\frac{4}{3}$

$x\geq-\frac{4}{3}$

$$\begin{cases} x < -\frac{4}{3} \\ -13\ (-4+4-\frac{4}{3}=4) \end{cases} \Rightarrow x = -2.$$

$$-4-3x-x=4$$

$$4x = -8$$

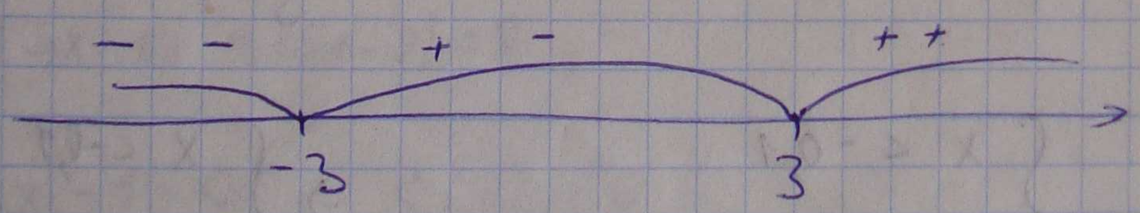
$$x = -2$$

$$\begin{cases} x \geq -\frac{4}{3} \\ 3x+4-x=4 \end{cases} \Rightarrow \begin{cases} x \geq -\frac{4}{3} \\ x=0 \end{cases} \Rightarrow x=0$$

б) $|2x-6|-|x+3|=x$

$2x-6=0 \qquad x+3=0$

$x=3 \qquad x=-3$



1. $x < -3$
2. $-3 \leq x \leq 3$
3. $x > 3$

$$\begin{cases} x < -3. \\ 6-2x+3+x=x \end{cases} \Rightarrow \begin{cases} x < -3. \\ 9=0 \end{cases} \Rightarrow x \in \varnothing$$

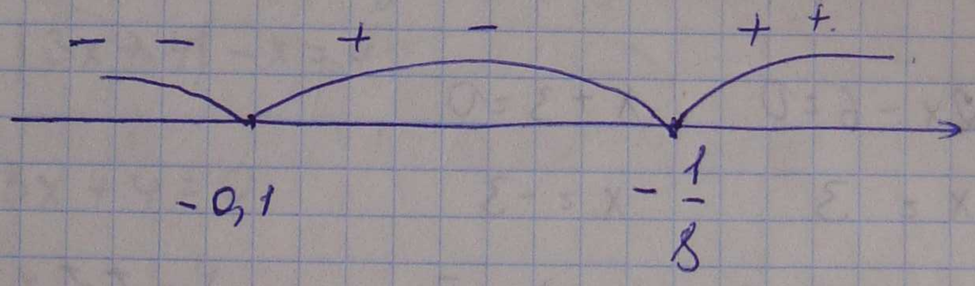
2. $\begin{cases} -3 \le x \le 3 \\ 6 - 2x - x - 3 = x \end{cases} \Rightarrow \begin{cases} -3 \le x \le 3 \\ x = \frac{3}{4} \end{cases} \Rightarrow x = \frac{3}{4}$

3. $\begin{cases} x \ge 3 \\ 2x - 6 - x - 3 = x \end{cases} \Rightarrow \begin{cases} x > 3 \\ 9 \ne 0 \end{cases} \Rightarrow x \in \varnothing$

g) $|0,1 + x| + 2|0,5 + 4x| < 2x$

$0,1 + x = 0 \qquad 0,5 + 4x = 0$

$x = -0,1 \qquad x = -\frac{1}{8}$



$\begin{cases} x < -0,1 \\ -x - 0,1 - 1 - 8x < 2x \end{cases} \Rightarrow \begin{cases} x < -0,1 \\ -1,1 < 11x \end{cases} \Rightarrow \begin{cases} x < -0,1 \\ x > -0,1 \end{cases}$

$x \in \varnothing$

$$\begin{cases} -0,1 \le x \le -\frac{1}{3} \\ 0,1 + x - 1 - 3x < 2x \end{cases} \Rightarrow \begin{cases} -0,1 \le x \le -\frac{1}{3} \\ -\frac{0,9}{9} < x \end{cases} \Rightarrow x > -0,1$$

$$-0,1 \le x$$

$$\begin{cases} x > -\frac{1}{3} \\ 0,1 + x - 1 + 3x < 2x \end{cases} \Rightarrow \begin{cases} x > -\frac{1}{3} \\ -0,9 + 9x < 2x \end{cases} \Rightarrow$$

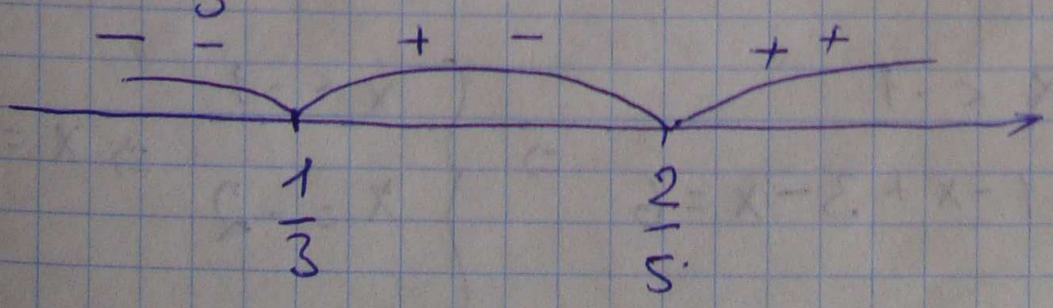
$$\Rightarrow \begin{cases} x > -\frac{1}{3} \\ \frac{0,9}{7} < x \end{cases} \Rightarrow x > \frac{0,9}{7}$$

Тиждень 5 ш.

1. $|3x-1| + |5x-2| = 5$

$3x - 1 = 0$ $\quad$ $5x - 2 = 0$

$x = \frac{1}{3}$ $\quad$ $x = \frac{2}{5}$



$$\begin{cases} x < \frac{1}{3} \\ 1 - 3x + 2 - 5x = 5 \end{cases} \Rightarrow \begin{cases} x < \frac{1}{3} \\ x = \frac{1}{4} \end{cases} \Rightarrow x \in \emptyset$$

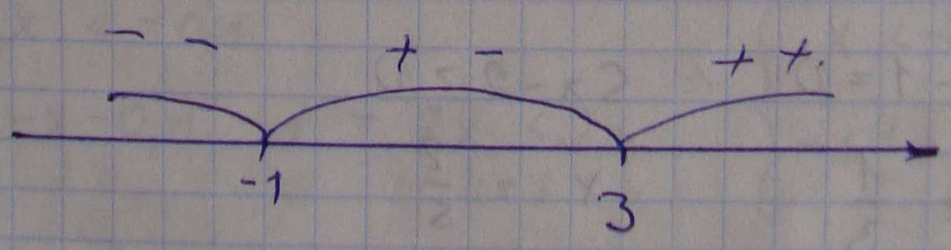
$$\begin{cases} \frac{1}{3} \leq x \leq \frac{2}{5} \\ 3x - 1 - 5x + 2 = 5 \end{cases} \Rightarrow \begin{cases} \frac{1}{3} \leq x \leq \frac{2}{5} \\ x = -2 \end{cases} \Rightarrow x \in \emptyset$$

$$\begin{cases} x > \frac{2}{5} \\ 3x - 1 + 5x - 2 = 5 \end{cases} \Rightarrow \begin{cases} x > \frac{2}{5} \\ 8x - 3 = 5 \end{cases} \Rightarrow \begin{cases} x > \frac{2}{5} \\ x = 1 \end{cases} \Rightarrow x = 1$$

2. $|x+1| + |x-3| = 6$

$x + 1 = 0$ $\qquad$ $x - 3 = 0$

$x = -1$ $\qquad$ $x = 3$



$$\begin{cases} x < -1 \\ -1 - x + 3 - x = 6 \end{cases} \Rightarrow \begin{cases} x < -1 \\ x = -2 \end{cases} \Rightarrow x = -2$$

$$\begin{cases} x < \frac{1}{3} \\ 1 - 3x + 2 - 5x = 5 \end{cases} \Rightarrow \begin{cases} x < \frac{1}{3} \\ x = \frac{1}{4} \end{cases} \Rightarrow x \in \emptyset$$

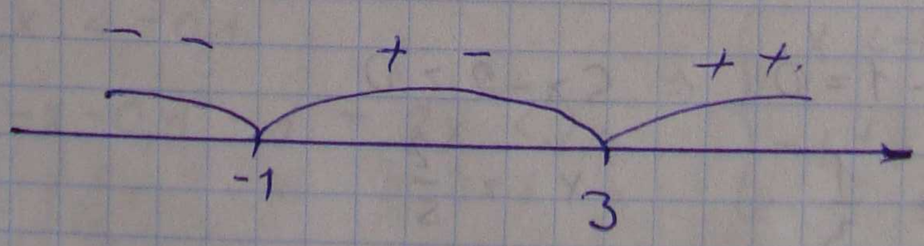
$$\begin{cases} \frac{1}{3} \leq x \leq \frac{2}{5} \\ 3x - 1 - 5x + 2 = 5 \end{cases} \Rightarrow \begin{cases} \frac{1}{3} \leq x \leq \frac{2}{5} \\ x = -2 \end{cases} \Rightarrow x \in \emptyset$$

$$\begin{cases} x > \frac{2}{5} \\ 3x - 1 + 5x - 2 = 5 \end{cases} \Rightarrow \begin{cases} x > \frac{2}{5} \\ 8x - 3 = 5 \end{cases} \Rightarrow \begin{cases} x > \frac{2}{5} \\ x = 1 \end{cases} \Rightarrow x = 1$$

2. $|x+1| + |x-3| = 6$

$x + 1 = 0$ $\qquad$ $x - 3 = 0$

$x = -1$ $\qquad$ $x = 3$



$$\begin{cases} x < -1 \\ -1 - x + 3 - x = 6 \end{cases} \Rightarrow \begin{cases} x < -1 \\ x = -2 \end{cases} \Rightarrow x = -2$$

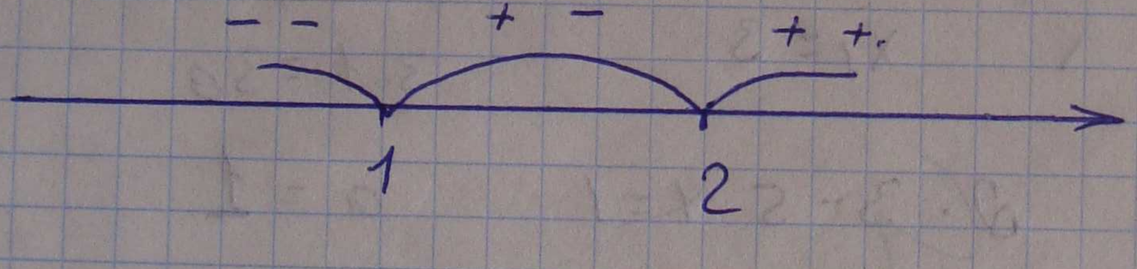
$$\begin{cases} -1 \leq x \leq 3 \\ x+1+3-x=6 \end{cases} \Rightarrow \begin{cases} -1 \leq x \leq 3 \\ 4 \neq 6 \end{cases} \Rightarrow x \in \varnothing$$

$$\begin{cases} x > 3 \\ x+1+x-3=6 \end{cases} \Rightarrow \begin{cases} x > 3 \\ x = 4 \end{cases} \Rightarrow x = 4$$

3. $|x-1| + |x-2| = 3$

$x-1=0$ $\quad$ $x-2=0$

$x=1$ $\quad$ $x=2$



$$\begin{cases} 1-x+2-x=3 \\ x<1 \end{cases} \Rightarrow \begin{cases} \\ \\ \end{cases}$$

3 ш.

1. $x^2 - 4x + 3a = 0$; $2x_1 - 5x_2 = 1$

$(D = b^2 - 4ac = 16 - 12a)$.

$(x - x_1)(x - x_2)$

$$\begin{cases} x_1 + x_2 = -\frac{b}{a} \; 4 \\ x_1 x_2 = \frac{c}{a} \; 3a \\ 2x_1 - 5x_2 = 1 \end{cases} \Big| \begin{matrix} \\ -2 \\ \\ \end{matrix} \Big| \Rightarrow \begin{cases} -2x - 2x_2 = -8 \\ 2x_1 + 5x_2 = 1 \\ -7x_2 = -7 \\ x_2 = 1. \end{cases}$$

$x_1 + x_2 = 4$

$x_1 = 3$

$3 \cdot 1 = 3a$

$2 \cdot 3 - 5 \cdot x = 1$

$6 - 5 = 1$

$a = 1$

5) $x^2 - 3x + a^2 + 3 = 0$

$$\begin{cases} x_1 + x_2 = +3 \\ x_1 x_2 = a^2 + 3 \\ 2x_1 - x_2 = 3. \end{cases} \Big| \begin{matrix} \\ -2 \\ \\ \end{matrix} \Big| \Rightarrow \begin{cases} -2x_1 + 2x_2 = -6 \\ 2x_1 - x_2 = 3 \\ -3x_2 = -3 \\ x_2 = 1. \end{cases}$$

$x_1 = 2$, $1 \cdot 2 - 3 = a^2$

3 м.

1. $x^2 - 4x + 3a = 0$; $2x_1 - 5x_2 = 1$

$(b = \underline{b^2 - 4ac} = 16 - 12a)$.

$(x - x_1)(x - x_2)$

$$\begin{cases} x_1 + x_2 = -\frac{b}{a} \; 4 \\ x_1 x_2 = \frac{c}{a} \; 3a \\ 2x_1 - 5x_2 = 1 \end{cases} \Bigg| -2 \Bigg| \Rightarrow \begin{cases} -2x - 2x_2 = -8 \\ 2x_1 + 5x_2 = 1 \\ -7x_2 = -7 \\ x_2 = 1. \end{cases}$$

$x_1 + x_2 = 4$

$x_1 = 3$ $\qquad 3 \cdot 1 = 3a$

$2 \cdot 3 - 5 \cdot x = 1$ $\qquad a = 1$

$6 - 5 = 1$

5) $x^2 - 3x + a^2 + 3 = 0$

$$\begin{cases} x_1 + x_2 = +3 \\ x_1 x_2 = a^2 + 3 \\ 2x_1 - x_2 = 3. \end{cases} \Bigg| -2 \Bigg| \Rightarrow \begin{cases} -2x_1 + 2x_2 = -6 \\ 2x_1 - x_2 = 3 \\ -3x_2 = -3 \\ x_2 = 1. \end{cases}$$

$x_1 = 2$, $1 \cdot 2 - 3 = a^2$

Ответ. 3ш рем. - 1 - 32 - 60 упущено

Zpb $b = 0$, $x_1 = x_2$

$$ax^2 + bx + c = a(x - x_1)^2$$

ср. физ. смысл.

—

р-ру $\Rightarrow$ б, ор x_1 и x_2 нрбмрбор

пебгуц физ. смыс. « пгар $(x - x_1)(x - x_2) = 0$

$x_1 = \frac{2}{3}$ $\left(x - \frac{2}{3}\right)(x - 3) = 0$

$x_2 = 3$ $x^2 - 3\frac{11}{x} + 2 = 0$

$ax^4 + bx^2 + c$

$x^2 = t \geq 0$.

$at^2 + bt + c = 0$

$t_1 t_2 - c$

$\div\ a_1 \quad a_1+d \quad a_1+2d.$

$\vdots\ a_1+3 \quad a_1+d \quad a_1+2d+4.$

$$a_2 = a \begin{cases} \dfrac{a_1 + a_1 + 2d}{2} = a_1 + d \\ (a_1+d)^2 = (a_1+3)(a_1+2d+4) \end{cases} \Rightarrow$$

$$\Rightarrow \begin{cases} a_1 + d = \\ \\ a_1^2 + d^2 + 2a_1 d = a_1^2 + 2a_1 d + 4a_1 + 3a_1 + 6d + 12 \end{cases}$$

$ax^2 + bx + c = 0$

шүлэг бүрдэл ашгүй

$a \neq 0$ $a, b, c \in R$.

x шийд 5

a-г шүлэг шинжлэх дүрэмлэл

1, $c = 0$, шүлэг $ax^2 + bx = 0$

$x(ax + b) = 0$

$\Rightarrow \begin{cases} x = 0 \\ x = -\frac{b}{a} \end{cases}$

$ax^2 + c = 0$

$x^2 = -\frac{c}{a}$

ш/ бүрэн $\frac{c}{a} > 0$, $x \in \varnothing$

бүрэн $\frac{c}{a} < 0$

$x_{1;2} = \pm\sqrt{-\frac{c}{a}}$

iii $c = b = 0$

$ax^2 = 0$

$a \neq 0$ $x = 0$

$ax^2+bx+c=0$

ск.

1 ax^2+bx+c үржүүлэх факторуудад задлах

үүнд:

квадрат гурвалсан илэрхийллийг

$$ax^2+bx+c = a\left(x^2+\frac{b}{a}x+\frac{c}{a}\right) =$$

$$a\left(x^2+\frac{2b}{2a}x+\frac{b^2}{4a^2}-\frac{b^2}{4a^2}+\frac{c}{a}\right) =$$

$$= a\left(\left(x+\frac{b}{2a}\right)^2-\frac{b^2-4ac}{4a^2}\right)$$

~~3-х~~

$$ax^2+bx+c=0$$

$$a\left(\left(x^2+\frac{b}{2a}\right)^2-\frac{b}{4a^2}\right)=0$$

Фактор нь $a\neq 0$

$$\left(x+\frac{b}{2a}\right)^2=\frac{b}{4a^2}$$

а) $b<0$ $x\in\varnothing$

~~Хэрэв~~ $b=0 \Rightarrow$

$\Rightarrow x+\frac{b}{2a}=0 \Rightarrow$

$x=-\frac{b}{2a}$

а) $3x^2 + x - 1 = 3\left(x^2 + \frac{1}{3}x - \frac{1}{3}\right) =$

$= x^2 + 2 \cdot \frac{1}{6}x + \frac{1}{36} - \frac{1}{36} - \frac{1}{3} =$

$= 3\left(\left(x + \frac{1}{6}\right)^2 - \frac{1+12}{36}\right) =$

$= 3\left(x + \frac{1}{6}\right)^2 - \frac{13}{12}$

4.) Дано $b > 0$, тогда $\left(x + \frac{b}{2a}\right)^2 - \left(\sqrt{\frac{D}{2a}}\right)^2 = 0$

$\left(x + \frac{b}{2a} - \sqrt{\frac{D}{2a}}\right)\left(x + \frac{b}{2a} + \sqrt{\frac{D}{2a}}\right) = 0$

$$\left[\begin{array}{l} x_1 = \frac{-b + \sqrt{D}}{2a} \\ x_2 = \frac{-b + \sqrt{D}}{2a} \end{array}\right.$$

$b = 2k$

$D = b^2 - 4ac > 0$

$$x_{1;2} = \frac{-2k \pm \sqrt{4k^2 - 4ac}}{2a} = \frac{-k \pm \sqrt{k^2 - ac}}{a}$$

$$k = \frac{b}{2}$$

$$ax^2 + bx + c = 0 \; ; \; a \neq 0$$

$$x^2 + px + q = 0$$

решить через дискр. приведенное, когда $a = 1$

$$D = p^2 - 4q > 0$$

$$x_{1;2} = \frac{b^2 - \sqrt{p^2 - 4q}}{2}$$

$$x_{1,2} = -\frac{p}{2} \pm \sqrt{\left(\frac{p}{2}\right)^2 - q}$$

Другой способ

$$ax^2 + bx + c = 0$$

$$D = b^2 - 4ac > 0$$

$$x_1 = \frac{-b - \sqrt{D}}{2a}$$

$$x_2 = \frac{-b + \sqrt{D}}{2a}$$

$$x_1 + x_2 = \frac{-b-\sqrt{D}-b+\sqrt{D}}{2a} = \frac{-2b}{2a} = -\frac{b}{a}$$

$$x_1 \cdot x_2 = \frac{(-b-\sqrt{D})^2}{4a^2} = \frac{-b^2-\sqrt{D}^2}{4a^2} =$$

$$= \frac{b^2-D}{4a^2} = \frac{b^2-b^2+4ac}{4a^2} = \frac{c}{a}$$

$$\begin{cases} x_1 + x_2 = -\frac{b}{a} \\ x_1 \cdot x_2 = \frac{c}{a} \end{cases}$$

x_1 и x_2 называются корнями квадратного трехчлена

$$x^2 - (x_1 + x_2)\cdot x + x_1 x_2 = 0$$

$$ax^2 + bx + c = 0$$

$$x^2 + px + q = 0$$

$D > 0$

$$\begin{cases} x_1 + x_2 = -p \\ x_1 \cdot x_2 = q \end{cases}$$

Ор

$x_1 = \frac{2}{3}$

$x_2 = 3$

$p = -(x_1 + x_2) = -\frac{11}{3}$

$q = x_1 \cdot x_2 = 2$

$$x^2 - \frac{11}{3}x + 2 = 0$$

$ax^2 + bx + c$

р - 5

Теп $D = b^2 - 4ac > 0$

и x_1 - с и x_2 - с кыл - ы шрбышгыр ⇒

бй, шшш

$$ax^2 + bx + c = a(x - x_1)(x - x_2)$$

Чышшуу: $\begin{cases} x_1 + x_2 = -\frac{b}{a} \\ x_1 x_2 = \frac{c}{a} \end{cases}$

$$ax^2 + bx + c = a\left(x^2 + \frac{b}{a}x + \frac{c}{a}\right) =$$

$$= a\left(x^2 - x(x_1 + x_2) + x_1 x_2\right) =$$

$$a\left(x^2 - xx_1 - xx_2 + x_1 x_2\right) =$$

$$= a\left(x(x - x_1) - x_2(x - x_1)\right) =$$

$$= a\left((x - x_2)(x - x_1)\right)$$

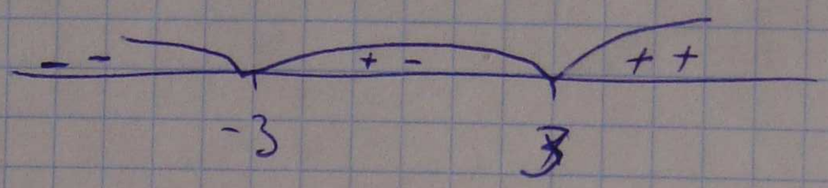
2

✓

г) $|2x-6| - |x+3| = x$

$2x-6=0$ $\quad x+3=0$

$x=3$ $\quad x=-3$



$\begin{cases} x \in (-\infty; -3) \\ 6-2x+x+3=x \end{cases} \Rightarrow \begin{cases} x < -3 \\ x = 4{,}5 \end{cases} \quad x \in \varnothing$

$\begin{cases} x \in [-3; 3] \\ 6-2x-x-3=x \end{cases} \Rightarrow \begin{cases} x \in [-3; 3] \\ 4x = 3 \end{cases} \Rightarrow \begin{cases} x \in [-3; 3] \\ x = \frac{3}{4} \end{cases}$

$\begin{cases} x \in (3; \infty) \\ 2x-6-x-3=x \end{cases} \Rightarrow \begin{cases} x \in (3; \infty) \\ -9 \neq 0 \end{cases} \quad x \in \varnothing$

Отв. $x = \frac{3}{4}$

Самост. 7-ка зад. 11.10, 11.11; №

бз 232 ✓ 7-12

бз 227 № 13, бз 271 №4-6.

Ещё задачи

5 шт №1-16

Ірацыянальныя ўраўненні

1. $|x| = a$

шэсць. выгл.

а) калі $a < 0$, $x \in \varnothing$

б) $a = 0$ адзіны корань $x = 0$

в) $a > 0$; 2 корні $x_1 = a$

$x_2 = -a$

2. $|f(x)| = a$

а) $a < 0$, $x \in \varnothing$

б) $a = 0$; $f(x) = a$

в) $a > 0$ $\begin{cases} f(x) = a \\ f(x) = -a \end{cases}$

3. $|f(x)| = \varphi(x)$

$\begin{cases} \varphi(x) \geqslant 0 \\ \left[\begin{array}{l} f(x) = \varphi(x) \\ f(x) = -\varphi(x) \end{array}\right. \end{cases}$ роўна $\left[\begin{array}{l} \begin{cases} f(x) \geqslant 0 \\ f(x) = \varphi(x) \end{cases} \\ \begin{cases} f(x) < 0 \\ -f(x) = \varphi(x) \end{cases} \end{array}\right.$

4. $|f(x)| = |\varphi(x)|$

$|f(x)|^2$

$f^2(x) = \varphi^2(x)$

sms

$f^2(x) - \varphi^2(x) = 0$

$(f(x) - \varphi(x))(f(x) + \varphi(x)) = 0$

$\begin{cases} f(x) = \varphi(x) \\ -f(x) = -\varphi(x) \end{cases}$

$|f(x)|^2 = |f(x)| \cdot |f(x)| =$

$= |f(x) \cdot f(x)| =$

$= |f^2(x)| = f^2(x)$

5

op $|3x - 7| = x + 1$

I kz $\begin{cases} x + 1 \geq 0 \\ \begin{cases} 3x - 7 = x + 1 \\ 3x - 7 = -x - 1 \end{cases} \end{cases}$ $\begin{matrix} x_1 = 4 \\ x_2 = 1,5 \end{matrix}$

Dvoji: $m\{1,5; 4\}$

II kz. $\begin{cases} 3x - 7 \geq 0 \\ 3x - 7 = x + 1 \end{cases}$, $\begin{cases} x \geq \frac{7}{3} \\ x = 4 \end{cases}$

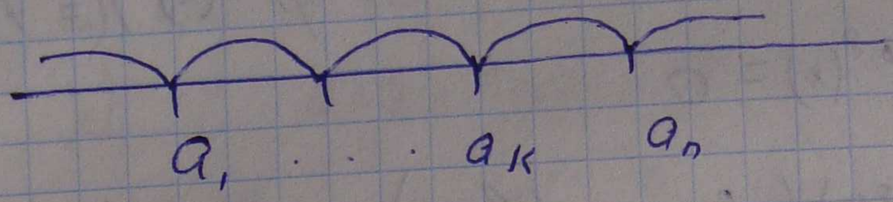
$\begin{cases} 3x - 7 < 0 \\ 7 - 3x = x + 1 \end{cases}$ $\begin{cases} x < \frac{7}{3} \\ 4x = 6 \; ; \; x = 1,5 \end{cases}$

5) $|f_1(x)| \pm |f_2(x)| \pm \ldots \pm |f_k(x)| = \varphi(x)$

$f_1(x) = 0 \quad x = a_1$

$f_k(x = 0 \quad x = a_k$

Длябить функцию
Единицу

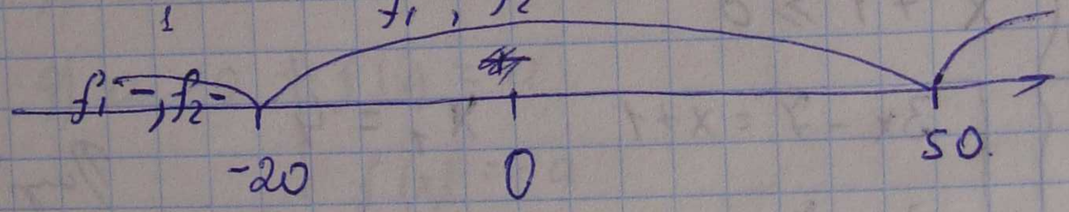


Упр 6 (241)

$|0,1x - 5| + 2|0,5x + 10| = 1 - 2x$

$f_1 = 0,1x - 5 = 0 \rightarrow x = 50$

$f_2 = 0,5x + 10 = 0 \rightarrow x = -20$



1 $\begin{cases} x < -20 \\ 5 - 0,1x + x - 20 = 1 - 2x \end{cases} \Rightarrow \begin{cases} x < -20 \\ 0,9x = 16 \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} x < -20 \\ x = \frac{160}{9} \end{cases} \quad x \in \varnothing$

2 $\begin{cases} x \in [-20; 50] \\ 5 - 9{,}1x + x + 20 = 1 - 2x \end{cases} \Rightarrow \begin{cases} x \in [-20; 50] \\ 2{,}9x = -24 \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} x \in [-20; 50] \\ x = -\frac{24}{2{,}9} \end{cases}$

3 $\begin{cases} x > 50 \\ 0{,}1x - 5 + x + 20 = 1 - 2x \end{cases} \begin{cases} x > 50 \\ 3{,}1x = -14 \end{cases} \Rightarrow$

$\Rightarrow \begin{cases} x > 50 \\ x = -\frac{14}{3{,}1} \end{cases}$ $x \in \varnothing$

3. [illegible]

4. Գծային [illegible]

Ֆ. անհավասարություններ

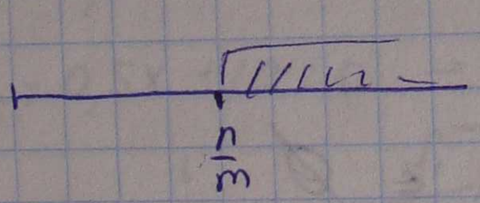
Ֆունկցիան գծային + այն անհավասարությունը գծային

$ax + b > cx + d \quad (<;\ \geq;\ \leq)$

$mx > n$

1. լուծում և քննարկում

1) $m \neq 0;\ m > 0 \qquad x > \frac{n}{m}$



2րդ $m < 0 \quad , x < \frac{n}{m}$

2 $(-\infty; \frac{m}{n})$.

3 $\begin{cases} m = 0 \\ n < 0 \end{cases}$ $0 > n$ $|X \in R$

4) $\begin{cases} m = 0 \\ n \geq 0 \end{cases}$ $0 > n$ $X \in \varnothing$

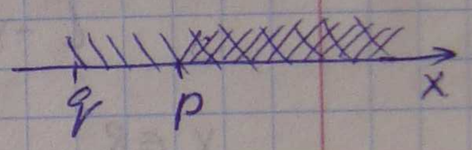
7-րդ դաս. - 5/9 Գլուխ 9 - 223 էջ

Անհավասարումների համակարգեր

Գծ. մեթ. եղանակով

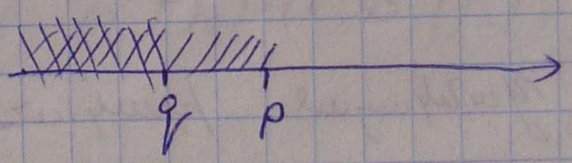
1) $\begin{cases} m_1 x > n_1 \\ m_2 x > n_2 \end{cases}$ $x = x_0$, երբ $\begin{cases} m_1 x_0 > n_1 \\ m_2 x_0 > n_2 \end{cases}$

Պարզություն $\overline{p > q}$



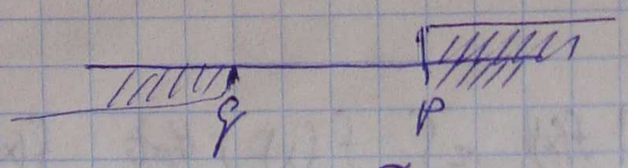
I դեպք $\begin{cases} x > p \\ x > q \end{cases}$ $x \in (p; \infty)$

II դեպք $\begin{cases} x < p \\ x < q \end{cases}$



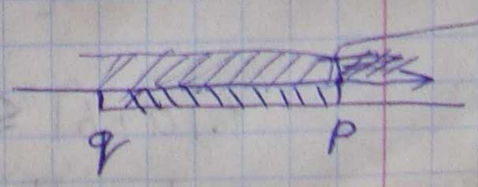
$x \in (-\infty; q)$

III դեպք $\begin{cases} x > p \\ x < q \end{cases}$



$x \in \varnothing$

4) $\begin{cases} x < p \\ x > q \end{cases}$ $x \in (q; p)$



Системы

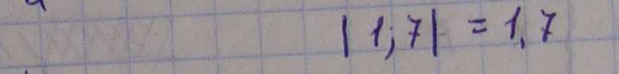
$$\cup \begin{cases} m_1 x > n_1 \\ m_2 x > n_2 \end{cases} \qquad \cup \begin{cases} x \in A \\ x \in B \end{cases}$$

$A \cup B$

Модуль числа

$$|x| = \begin{cases} x, \text{ при } x \in & x \geq 0 \\ -x, \text{ при } x \in & x < 0 \end{cases}$$

$x \in R$



$|1,7| = 1,7$

Уравнения вида

$|-2| = 2$

$|0| = 0$

$$|x+1| = \begin{cases} x+1, \text{ при } x+1 \geq 0, x \geq -1 \\ -x-1, \text{ при } x+1 \leq 0 \end{cases}$$

$$|f(x)| = \begin{cases} f(x), \text{ при } f(x) \geq 0 \\ -f(x), \text{ при } f(x) \leq 0 \end{cases}$$

1. $|a+b| \leq |a| + |b|$
2. $|a-b| \geq |a| - |b|$
3. $|ab| = |a||b|$
4. $\left|\frac{a}{b}\right| = \frac{|a|}{|b|}$

Неравенства

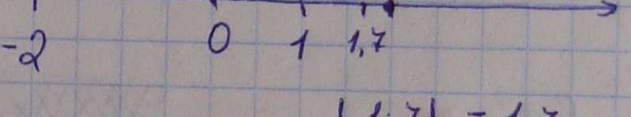
$$\cup\begin{cases} m_1 x > n_1 \\ m_2 x > n_2 \end{cases} \qquad \cup\begin{cases} x \in A \\ x \in B \end{cases}$$

$A \cup B$

Модуль числа

$$|x| = \begin{cases} x, \text{ при } x \in & x \geq 0 \\ -x, \text{ при } x \in & x < 0 \end{cases}$$

$x \in R$



$|1;7| = 1,7$

~~$|2| = -2$~~

$|-2| = 2$

$|0| = 0$

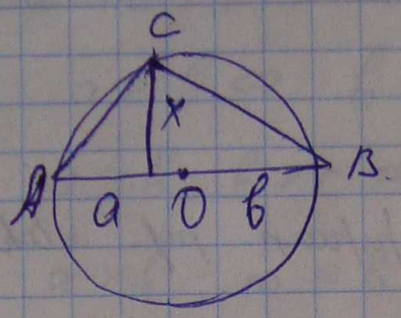
Уравнения модуль

Решить уравнение:

$$|x+1| = \begin{cases} x+1, \text{ при } x+1 \geq 0, x \geq -1 \\ -x-1, \text{ при } x+1 \leq 0 \end{cases}$$

$$|f(x)| = \begin{cases} f(x), \text{ при } f(x) \geq 0 \\ -f(x), \text{ при } f(x) \leq 0 \end{cases}$$

1. $|a+b| \leq |a| + |b|$
2. $|a-b| \geq |a| - |b|$
3. $|ab| = |a||b|$
4. $\left|\frac{a}{b}\right| = \frac{|a|}{|b|}$



$$x = \sqrt{ab}$$

$$\frac{cb}{a} = \frac{b}{cb}$$

$$h_c = \sqrt{a_c \cdot b_c}$$

$$f_1(x) > f_2(x)$$

$$x^2 - 2 > 3x + 7$$

р.ш.р

$$\frac{3x - 2}{x} < 5$$

1. [illegible]

2. [illegible] $|x = c$

[illegible]

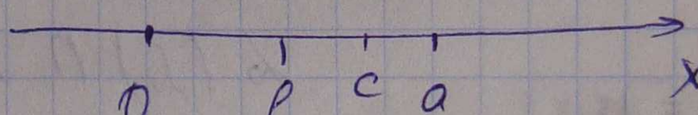
Рц. шкалы.

a и b рц/ф

$a > b \Leftrightarrow a - b > 0$
$a < b \Leftrightarrow a - b < 0$
} рефлр рц. шкалы.

$a = b \Leftrightarrow a - b = 0$

$a \not< b \Leftrightarrow a \geq b$
$a \not> b \Leftrightarrow a \leq b$
] рц рефлр шкалы.-ные



$b < c < a$ - графич шкалы.

$(b; a)$ - откр отрезок

$[\ )$ - полуотк отрезок

$[\ ]$ - закр отрезок

$c > 1$

$c \in (1; +\infty)$

$c < 1$

$c \in (-\infty; 1)$

6) Дано $\begin{cases} a>b>0 \\ c>d>0 \end{cases} \Rightarrow ac > bd$

$a > b \qquad c > 0$

$ac > bc$

$c > d \qquad b > 0 \Rightarrow bc > db$

$\left.\begin{matrix} ac > bc \\ bc > db \end{matrix}\right\} \Rightarrow ac > db$

7. $a > b > 0, \; n \in N \Rightarrow a^n > b^n$

$a > b > 0, \; n \in N \Rightarrow a \vee \sqrt[n]{a} > \sqrt[n]{b}$

Ред. шаньд. Аштарар.

1. Дрд $a > b \Leftrightarrow b < a$

2. Дрд $a > b: b > c \Rightarrow a > c$

3. Дрд $a > b: m \in R \Rightarrow a + m > b + m$

4. Дрд $a > b: m > 0 \Leftrightarrow a \cdot m > bm$

$m < 0 \Leftrightarrow am < bm$

5. Дрд $a > b: c > \beta$, шшш $a + c > b + d$

$\begin{array}{l|l} a > b & a - c > b - d \\ c < d & \end{array}$

8. $a > b > 0$, тогда $\frac{1}{a} < \frac{1}{b}$

$$\frac{1}{a} - \frac{1}{b} = \frac{b-a}{ab} < 0$$

9.

9. $a > 0$

$$\frac{1}{a} + a \geq 2$$

$$\frac{1}{a} + a - 2 = \frac{1 + a^2 - 2a}{a} = \frac{(a-1)^2}{a} \geq 0$$

$a_i > 0$

$i = 1; 2; 3; 4; \dots; n$

среднее арифм. $\frac{a+b}{2}$

$$\frac{a_1 + a_2 \dots a_n}{n}$$

среднее геометр. $\sqrt{ab}$; в степени $\sqrt[n]{a_1 \dots a_n}$

$$\frac{a_1 + a_2 + \dots a_n}{n} \geq \sqrt[n]{a_1 a_2 \dots a_n}$$

$a_1 > 0$ $\quad \frac{a_1 + a_2}{2} \geq \sqrt{a_1 a_2}$

$a_2 > 0$

8. $a > b > 0$, нужно $\frac{1}{a} < \frac{1}{b}$

$$\frac{1}{a} - \frac{1}{b} = \frac{b-a}{ab} < 0$$

9.

9. $a > 0$

$$\frac{1}{a} + a \geq 2$$

$$\frac{1}{a} + a - 2 = \frac{1 + a^2 - 2a}{a} = \frac{(a-1)^2}{a} \geq 0$$

$a_i > 0$

$i = 1; 2; 3; 4; \ldots; n$

среднее арифм. $\frac{a+b}{2}$

$$\frac{a_1 + a_2 \ldots a_n}{n}$$

среднее геометр. $\sqrt{ab}$; в степени $\sqrt[n]{a_1 \ldots a_n}$

$$\frac{a_1 + a_2 + \ldots a_n}{n} \geq \sqrt[n]{a_1 a_2 \ldots a_n}$$

$a_1 > 0$ $\quad \frac{a_1 + a_2}{2} \geq \sqrt{a_1 a_2}$

$a_2 > 0$

$\sqrt[2]{ab_1 \cdots a_n}$

59^{241} – 7; 8

59^{243} – № 4, 5

Ч.1 – 12

47. 32 – 36, 41., 42 43, 48, 51., 55, 56, 59.

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